May, 1945 Vol. 34, No. 5

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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- Influence of Present Training Programs on our Future Educational Activities — *Belman*
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REQUISITION NUMBER

The Shop Teachers' Professional Magazine

PHOTO COURTESY: FOSTORIA PRESSED STEEL CORPORATION

Pure Gold is BETTER

It would seem as if there were never a lack of energy for all the multitudinous jobs that mankind must perform, all the manifold problems that man must solve. What is so often lacking, what is so often needed, is the means of mobilizing, directing and applying energy available. For example, since man has solved the problem of collecting and directing the waves of infra-red energy he has been able to turn this energy to invaluable uses in industrial heating, drying and baking. Not only that, it has been found that pure gold is better than any of the baser metals in plating the reflectors that collect and direct these energy waves.

The same problem confronts the educator too . . . of collecting and directing the energy of the lads in his classroom . . . of mobilizing and directing their interest . . . of firing their imagination and their ambition so not only that the lad performs creditable classroom work but that he *acquires the habit of doing creditable work*. Together with aroused ambition and a sound set of standards, this is all the equipment a boy needs to make his way in life.

Here too in this important task, instructors have found that "pure gold" is better. Instructors in mechanical drafting are well aware of the value of *fine* drawing instruments in setting the level of all the work that confronts a boy when he first comes to class. These self-same instructors know only too well how cheaply made, carelessly selected instruments can cheapen the worth of all the fledgling is about to undertake. These instructors know how closely akin are pride of possession, pride of craftsmanship and that especial personal pride that prevents a boy from stooping to the snide, the mediocre, the cheap. Knowing all this the competent and intelligent instructor will not permit the slightly higher cost of fine instruments to stand in the way of their selection. He also knows that this slightly higher cost is the real investment and that it will return itself a thousand-fold to the boy who pays it.

Army-Navy "E" Production Award for Excellence in Manufacturing, Drafting and Surveying Instruments and Supplies for the Armed Services of the United States.

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EVERYTHING FOR DRAFTING AND SURVEYING

SOUTH BEND LATHES

Skillfully Built to Train Skilled Hands

Great as the progress has been in industrial education, the coming peace-time era will demand even greater forward strides. Schools must be geared to a triple objective: training returning veterans, retraining thousands of war workers, and training the normal annual quotas of new students.

War worker, student, or veteran; the object will be to create "skilled hands"; and the tools for instruction are all-important. Skill comes quickly, more surely, to hands that are trained with precision tools, and it is *precision*—for which South Bend Lathes are best known. Their modern design, ease of operation, convenience of control, and extensive use in industry further recommend South Bend Lathes for modern school shops. They should be included in your modernization and replacement program to keep your shop training courses abreast of industry's progress.

Write for a copy of our new Catalog 100-D that illustrates in full color South Bend Engine Lathes, Toolroom Lathes, and Precision Turret Lathes.

GET THESE TRAINING HELPS

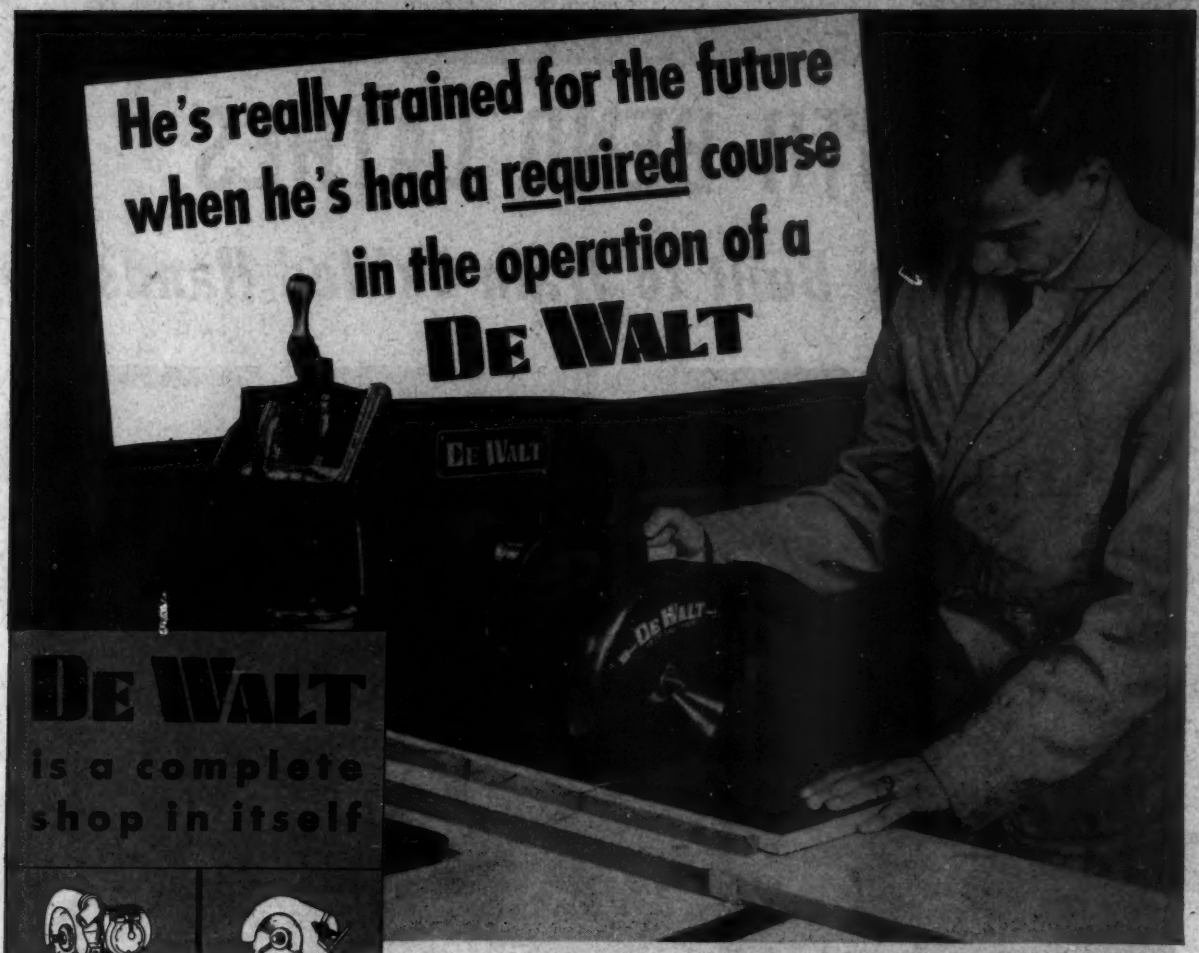
In planning your post-war program include our books, sound films, wall charts and bulletins on lathe operation and care. Write for circular No. 21-D describing these training helps.

SOUTH BEND LATHE WORKS

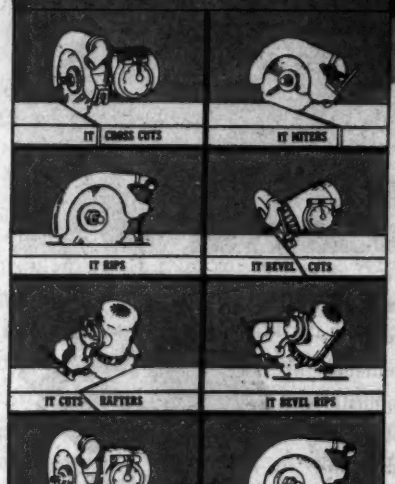
466 EAST MADISON STREET • • • SOUTH BEND 22, INDIANA

LATHE BUILDERS FOR 38 YEARS

He's really trained for the future when he's had a required course in the operation of a DE WALT



DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

After the student has completed his basic training course in the use of hand tools, he should have a *required* course in the operation of DeWalt.

Knowing how to make the fullest use of this flexible, easy-to-operate machine, will give any student a head-start as he prepares for tomorrow's industry.

When he leaves school he will be fully acquainted with a machine that is destined to occupy a prominent place in tomorrow's industry. The perfection of the DeWalt saw has created new methods in cutting wood, making obsolete old-style equipment previously used.

We urge you to investigate DeWalt. *Install* DeWalt in your school.

16 MM SOUND MOVIE—"DeWalt Saws in the War Program." The only sound movie on woodworking machinery now being used by the armed forces as part of their regular training courses. Available for supervisor meetings at no obligation. Write for details.

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☐ I would like more information about DeWalt Sound Movie.

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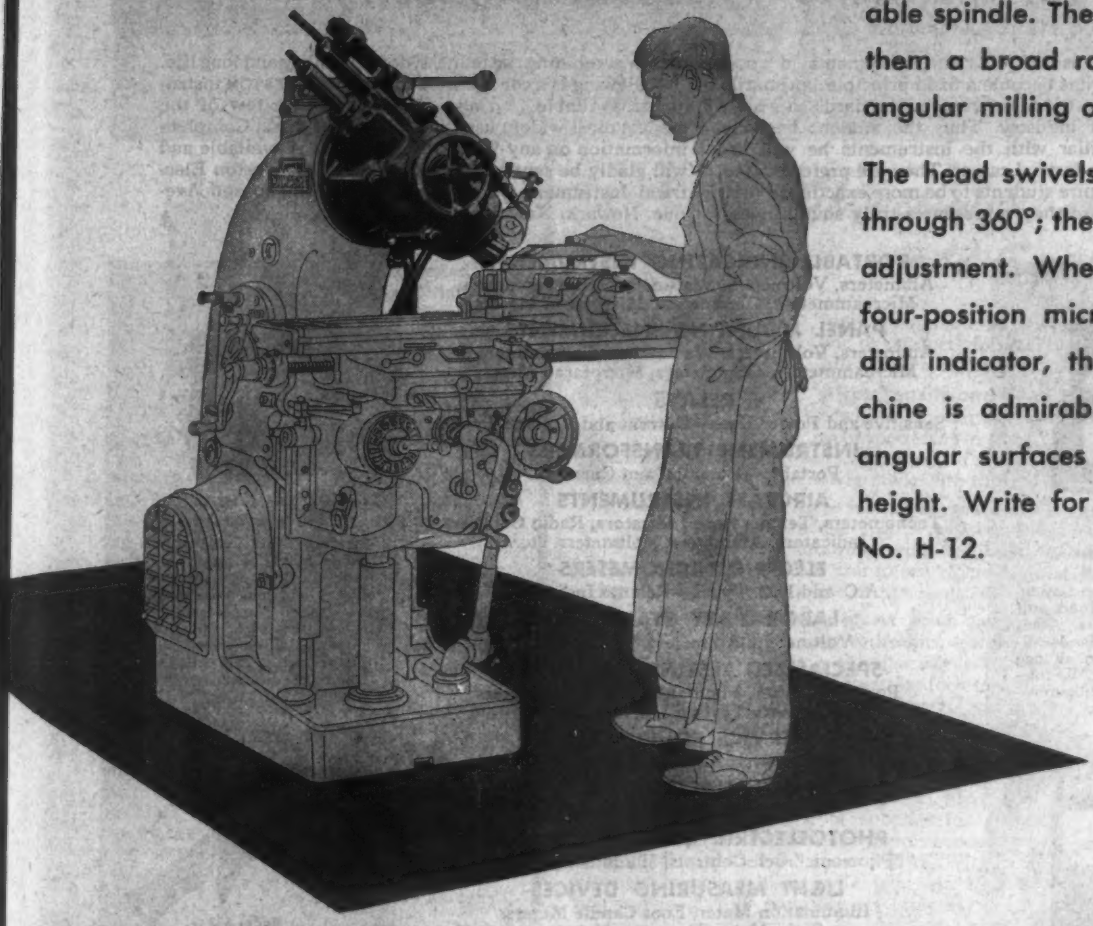
Range for Angular Milling Operations:



Vertical types of Models 1H and 2HL Milwaukee Milling Machines are designed with a swivel head and adjustable spindle. These two features give them a broad range in the field of angular milling operations.

The head swivels in a vertical plane through 360°; the spindle has 3½ inch adjustment. When equipped with a four-position micrometer stop and a dial indicator, the swivel head machine is admirably suited to milling angular surfaces of more than one height. Write for descriptive bulletin No. H-12.

IDEAL FOR TECHNICAL INSTRUCTION

SAFETY centralized controls with built-in safety interlocks make it impossible to engage power controls when hand controls are in use.

MODERN DESIGN many features of advanced design usually found only in larger machines facilitate instruction that is up-to-date.

QUALITY CONSTRUCTION double overarms, full-back column and other Milwaukee features provide stamina to withstand the handling of inexperienced operators.

LOW HEIGHT adapts the machines to students; compact design provides easy reach and accessibility.

FINGER-TOUCH CONTROLS centralized and within easy reach, require minimum manual effort.

INDUSTRIAL ACCEPTANCE widely used in industry, Milwauke milling machines will be familiar tools to the student when he takes a job.

Milwaukee Milling Machines possess an unusual number of features of great value and appeal to the technical instructor. Engineering colleges, technical and vocational schools in the United States and abroad find Milwaukee exceptionally well adapted to classroom work.

For the best instruction in current milling machine technique, modern equipment is essential. Outmoded and obsolete machines are increasingly being replaced with Milwaukees because they embody the maximum of advanced as well as timetested features of design and construction.

Kearney & Trecker Corporation has always maintained close relations with technical educators and institutions and invites correspondence on all milling machine and machine tool subjects.

Milwaukee Machine Tools

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MILWAUKEE 14, WISCONSIN

The World's STANDARDS OF ACCURACY

for Instruction, Research, Industry

The widespread use of WESTON instruments in vocational education has become a fixed principle...primarily because these are the measurement standards so widely used throughout industry. Thus the student becomes thoroughly familiar with the instruments he will use throughout his industrial career. They are preferred, too, because they inspire students to be more exacting in their work, and because they represent a truly sound investment...combining ruggedness, dependability and long life.

Following is a condensed listing of the WESTON instruments available . . . also are illustrated a few of the models most widely used in educational work. Complete information on any WESTON instrument is available and will gladly be sent on request. Write to... Weston Electrical Instrument Corporation, 595 Frelinghuysen Avenue, Newark, New Jersey.

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D. C. Instruments

Sturdy portable test instruments for accurate testing. Magnetically shielded, polished hardwood case. Accuracy ½ of 1%. Hand calibrated mirror scales of long length. Available in Voltmeters, Ammeters, Milliammeters, Volt-Ammeters.

Model 430
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Universally used in schools and industry wherever rugged, portable instruments are required for general testing. Hand calibrated, mirror scales with knife-edged pointers.

Model 785
Industrial Circuit Tester

Provides 27 ranges . . . all the ranges necessary for voltage, current and resistance measurements in signal, control and electronic circuits, or wherever else high sensitivity is a factor.

PORTABLE INDICATING INSTRUMENTS
Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

PANEL MOUNTING INSTRUMENTS
Ammeters, Voltmeters, Wattmeters, Galvanometers, Microammeters, Ohmmeters, Microfarad Meters

RELAYS
Sensitive and Power Uses—Current and Voltage Types

INSTRUMENT TRANSFORMERS
Portable—Potential and Current

AIRCRAFT INSTRUMENTS
Tachometers, Temperature Indicators, Radio Compass Indicators, Ammeters, Voltmeters, etc.

ELECTRIC TACHOMETERS
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SPECIALIZED TESTING EQUIPMENT
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"Photronic" Cells—Dry Disc Type

PHOTOELECTRIC CONTROL DEVICES
"*Photronic" Cell Controls, Illumination Controls

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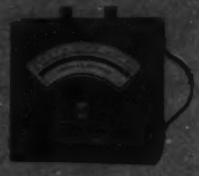
Small, sturdy, inexpensive . . . for all-around A.C. and D.C. testing where moderate accuracy is sufficient. Available in Voltmeters, Ammeters, Milliammeters. A.C. models available in single, double and triple ranges.



Model 155
A. C. Instruments

Single or multi-range instruments, movable iron type, for general testing where high accuracy and long scale length are desired. Ammeters available with ranges up to 500 amperes, self-contained; Voltmeters up to 750 volts, self-contained. Sturdy, hardwood cases.

Model 633
A. C. Clamp Ammeter

Current readings obtained simply by placing clamping jaws around conductor. Circuits never disturbed. 6 current ranges. High insulation for complete protection.

Model 772
Super-Sensitive Radio Set Tester

Sensitivity of 20,000 ohms per volt. Adequate voltage, current, resistance and output meter readings for servicing receivers, transmitters, P. A. systems, vacuum and cathode ray tube equipment, communications circuits, etc.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, May, 1945, Volume 34, No. 5. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee 1, Wis. Entered January 3, 1914, as Second-Class Matter at Milwaukee 1, Wis., under Act of March 3, 1879. Subscriptions — U. S., $2.50 per year. Canada, $2.75, and Foreign, $3.00. Single copies, 35 cents.

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Your supply depot for

oxyacetylene flame and electric arc welding equipment and supplies

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Airco Oxygen is produced and tested under the most rigid scientific procedures, and is guaranteed to be 99.5% pure in the cylinder. High purity assures maximum speed and economy in cutting, and greater efficiency in welding.

Airco Acetylene has been proved by use and tests to be the most economical fuel gas for pipe welding and other flame welding operations.

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National Carbide (in the red drum) is made from the finest available coke and limestone by the most modern manufacturing methods. It is evenly sized and dust-free, and gives a high, uniform yield of acetylene gas. Available in six sizes in 100 lb. and 25 lb. drums, and 2 lb. and 10 lb. cans.

Tensile Test Machine

Oxyacetylene Apparatus and Supplies

Airco manufactures and distributes a complete line of products for every oxyacetylene flame use. Among these many products are:

Airco Tensile and Bend Testing Machine: This newly designed machine permits rapid testing of weld specimens in shop, laboratory, or on field operations. Guided bend tests, transverse tension, and longitudinal all-weld metal tension tests are quickly made with this compact Airco machine.

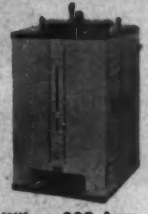
Airco Hand Torches: Airco torches are made in a complete line of types for gas welding, cutting and many other oxyacetylene flame applications. Precision-made from the finest materials available, Airco torches have been noted for over 25 years for sturdiness, efficiency, and scientifically-balanced construction. A complete line of tips is also available.

Airco Gas Pressure Regulators: Airco gas pressure regulators are made in a wide range of styles for controlling gas pressures in cutting, welding, and other oxyacetylene processes. They are available in styles for use with oxygen, acetylene, hydrogen, nitrogen, carbon dioxide, and other commercial gases. Ruggedly constructed, accurate, and dependable, Airco regulators are designed to give long, reliable service.

Gas Welding and Cutting Supplies: Airco also provides a complete line of supplies for every oxyacetylene flame application—welding rods, flux, hose, goggles, gloves and many others. Whatever you need for gas welding and cutting, Air Reduction can meet your requirements promptly.

Arc Welding Machines, Electrodes and Accessories:

The Wilson "Hornet", famous for its smooth, steady arc, easy regulation, and reliable service, is ideal for general purpose DC welding. Made in 200, 300, 400 amp. sizes.



Wilson 200 Amp. "Bumblebee"

The Wilson "Bumblebee" AC welders (indoor and "All-Weather" models) are supplied in 300 and 500 amp. sizes and other AC units in 100, 200, 750 and 1000 amp. sizes.

A complete line of shielded arc AC and DC electrodes. Airco No. 78E and 79E are ideal for DC all-position, general purpose welding where excellent physical qualities are needed. Airco No. 87 is recommended for single or multiple pass DC or AC welding on rusty work and where fit-up is poor. Airco No. 230 is a "top-notch" electrode for all-position AC welding.

Arc Welding accessories include helmets, holders, cable, clamps, gloves, brushes, etc.

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ARMSTRONG

TURRET LATHE AND SCREW MACHINE TOOLS

Today, America Needs TURRET LATHE and SCREW MACHINE OPERATORS

The transition from tooling-up to all-out production has increased the need for turret lathe and screw machine operators. When preparing your courses to help fill this need it would be well to build them around ARMSTRONG TURRET LATHE and SCREW MACHINE TOOLS. These are provided for the basic operations, and take standard drills and knurls or cutters that anyone can quickly grind from stock shapes of high speed steel. Permanent, multiple-purpose tools, they reduce tooling-up to the selection of cutters, adjustment for clearance and tightening of set screws.

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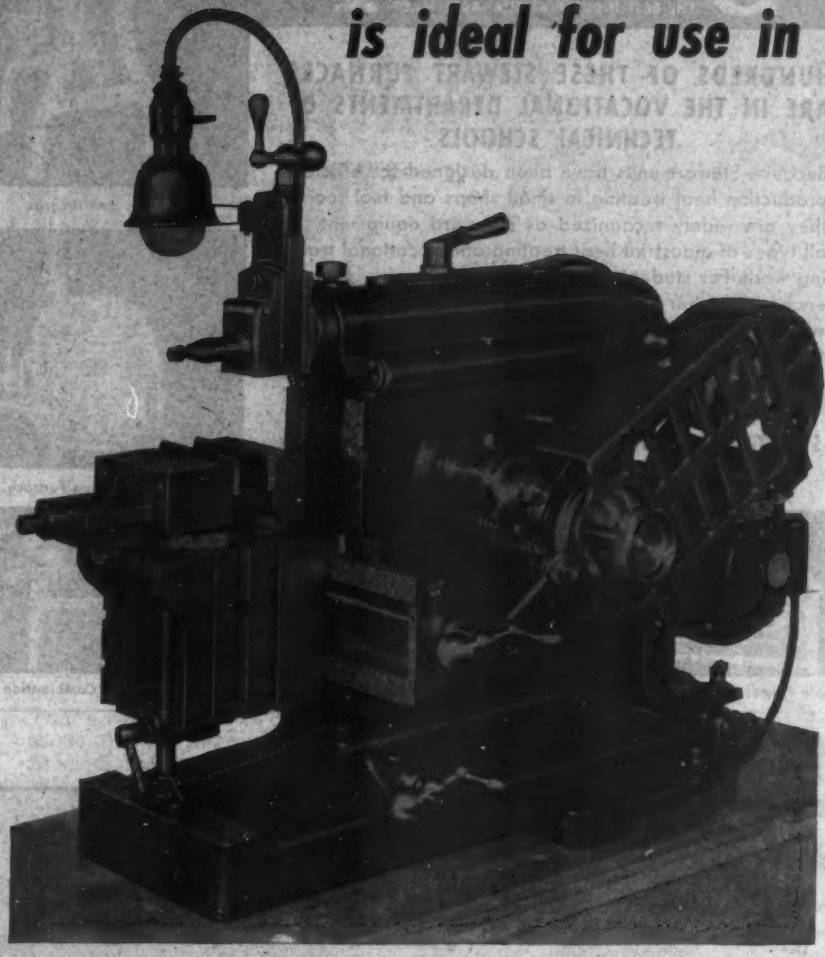
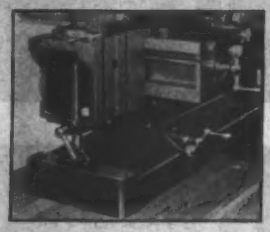
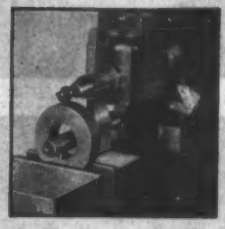
AMMCO 7" PRECISION SHAPER

is ideal for use in school shop!

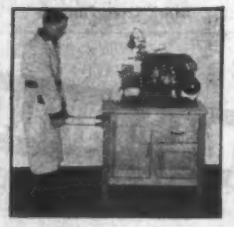




★ Has "VEE" Type Ways, comparable to those of large, expensive shapers.



★ Handles a wide variety of work.



★ Portable Model is mounted on maple cabinet.

Students quickly acquire ability to produce accurate work on this precision machine

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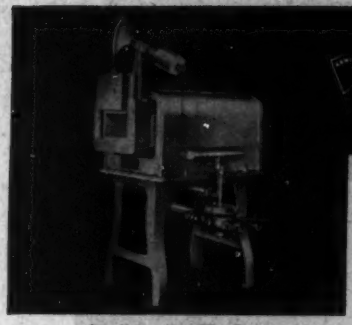

Small Semi-Muffle Oven

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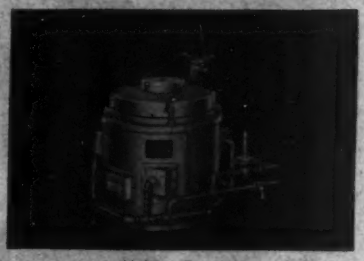
Round Pot Furnace



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Bench Oven Furnace — Triple Purpose Combination "E" — Triple Purpose Combination "D" — Dual Combination

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DIVISION OF THE STANLEY WORKS • EDUCATIONAL DEPT.
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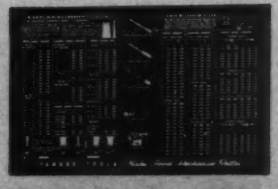
"YANKEE" TOOLS
THE ANSWER TO SMART TEACHING

Good mechanics may be born, not made. But better mechanics are *made* by "Yankee" Fine Mechanics' Tools, the choice of discriminating users everywhere, for more than half a century. And why are "Yankee" Tools their choice? Because they have been *designed* to save time, money, and trouble on their jobs . . . and because they are *built* to give long, hard, dependable service. There's a better-mouse-trap ingenuity about "Yankee" Tools that makes them teacher's pet. But now, of course, "Yankee" Tools are working for war, and Demand has made a Casualty of supply. But Victory will mend all that, and you will one day again be training youth and inexperience with the tools that age and experience demand.

FREE! Write for a copy of the handy "Yankee" Reference Chart, featuring relative tables of screw-driver blade and screw sizes, and giving graphic instructions on how to drive screws correctly.



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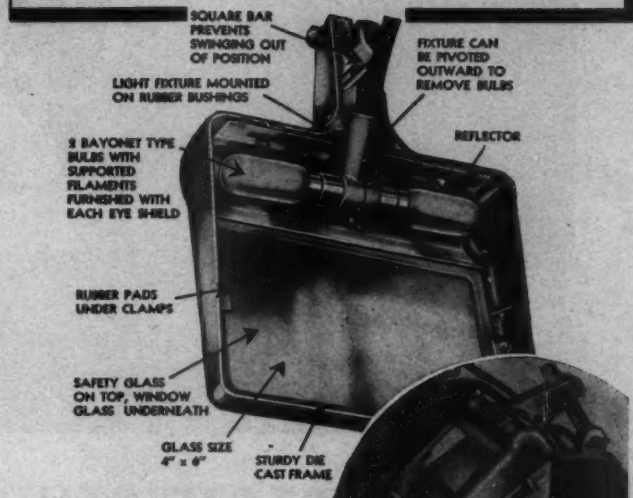
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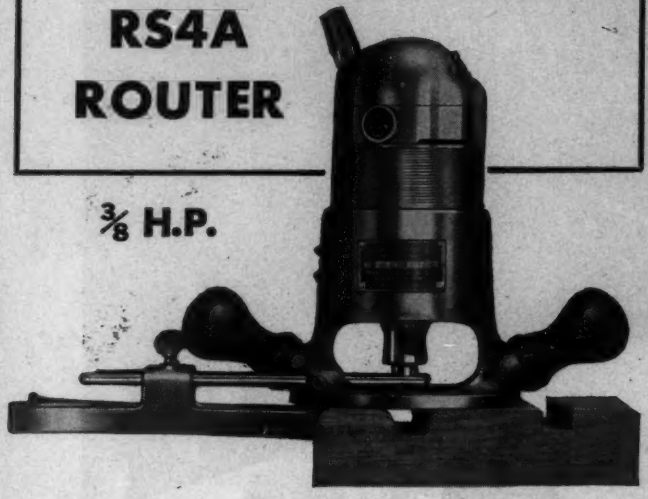

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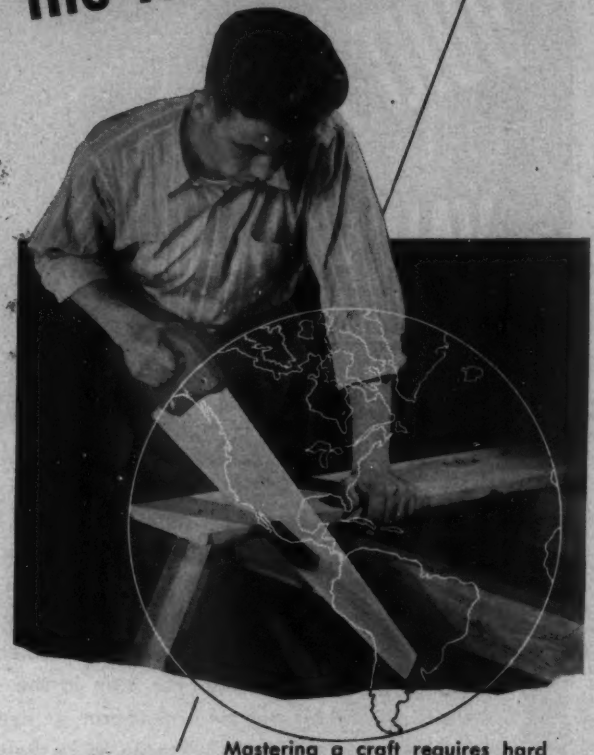

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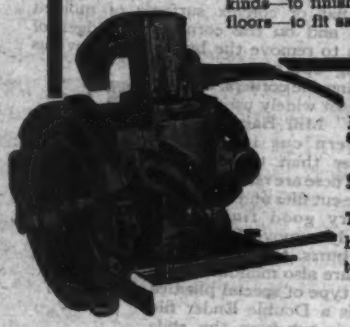

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THE NICHOLSON "FIRST READER" ON PLASTICS FILING

By WILLIAM N. DUDLEY
Research Department
NICHOLSON FILE CO., Providence, R. I.

FILES are very important tools for finishing molded plastics parts and for beveling, smoothing, burring and fitting the edges and corners of plastic sheets. In finishing plastics, files are used to remove the flash and for burring the parts after machining operations such as drilling and tapping.

The size and shape of file best suited for a particular job are determined by the size, shape or contour of the part to be filed. The cut, or number of teeth per inch, is generally governed by the requirements as to finish and by the type of plastic to be filed.

Much of the filing done on plastics is hand filing, so that the most commonly required standard file sizes used are 6", 8" and 10". Larger sizes are used on such units as aircraft wing and fuselage forming dies or on plastic sheets and resin-bonded plywoods. Smaller sizes of files, usually in Swiss Pattern type, are often needed on small intricate instrument parts.

Both American and Swiss Pattern files are used and such shapes as Mill or Flat, Pillar, Half Round, Round, Square, Three Square, Warding and Knife generally will meet most of the requirements of plastic filing jobs. As finish is relatively important, either single cut or the finer double cut files are commonly used. There are occasions, such as the filing of heavy industrial moldings, often made of asbestos or fiber filled materials, where the coarser cuts are used in order to effect the quick removal of stock which may be of more importance than a fine finish.

COMMONLY USED PLASTICS FILE SHAPES
(Cross Sections)

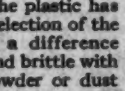
Correct Filing for Maximum Production

The correct use of files is important to obtain maximum production with suitable finish and to get the most efficient use from the files. Files are designed to cut in one direction only, therefore for most filing the pressure stroke should be in that direction. Ordinarily, the pressure should be relieved on the return stroke to prevent unnecessary file wear. There are occasions, as on fine, intricate parts, where a steady pressure on both cutting and return stroke results in a little better finish. Steady pressure is also used when cleaning out dead-end holes and slots. It is economical to use as much of the file surface as possible, both length and width, so that the file will wear uniformly and not become dulled in one place while the rest of the teeth are sharp.

Flash removal and finishing of molded plastics present a variety of problems. Not only do different plastics have varying qualities of hardness and brittleness, but frequently there are recesses to be reached, corners and angles to be cleared out, bevels to be trued, slots or notches to be smoothed up or enlarged, holes to be reamed out and working fits to be made. Much of the filing is to remove the flash lines that are prevalent on all compression molded articles where there is a division between sections of the mold construction. Slightly imperfect matching of the mold sections produces a flash line which becomes increasingly heavier as the mold wears through continued use. In compression molding, the filing procedure is largely determined by the ultimate purpose of the part and the significance of a smoothly finished surface. Flash lines concealed from view require nothing more than a simple filing operation, using the coarser files to remove the flash as quickly as possible.

Although plastics of different types may vary in their properties, there is one characteristic that is common to most all types —their abrasive action on file teeth as on other cutting tools as well. In many cases, regular general purpose files give satisfactory results, but on production jobs where considerable filing is done it is better to use files that have been designed for use on plastics. Files for plastics should have these important individual features: (1) comparatively wide gullets to minimize clogging—especially when used on shreddy materials; (2) high, thin-topped teeth for fast cutting and to maintain serviceable cutting edges for a long time under the abrasive action of most types of plastics.

Ordinary Type File Tooth


Plastic Type File Tooth

The relative hardness of the plastic has a great deal to do with the selection of the proper file cut. It makes a difference whether the plastic is hard and brittle with the material removed in powder or dust form, or whether it is soft and gummy so that when it is filed it is removed in shreds.

Filing Hard Plastics

The phenolics and ureas have an extremely hard and dense surface and when filed the material is removed in the form of a light powder or dust. These plastics are characterized by a brittle flash. When filing the flash, the best practice is to break the flash towards a solid portion rather than away from the main body to prevent chipping of the finished piece. The file is used to best advantage when pushed with a firm stroke to break off the flash close to the body and then removing the flash down to the line desired. File marks on thermosetting plastics can be kept almost indistinguishable and frequently no additional finishing operation is required, or at the most a wiping of the filed surface with an oily cloth to bring out the luster.

Generally, very little difficulty is experienced with files clogging up on these harder plastics. Filings will collect in the teeth but they are easily removed by brushing or by rapping the file on a wood block or on the bench top.

"Dry" Files for Plastics

New files ordinarily have a light coating of oil on their surface as a rust preventive. If there is a tendency for the filings, which are light and powdery, to adhere to the teeth or collect in the gullets because of the oil film, the file can be chalked up and then brushed to remove the oil film. This is done by rubbing the surface of the file with a piece of chalk. The chalk fills the spaces between the teeth and absorbs the oil. The chalk and oil are then removed by brushing the file, leaving a dry surface free of oil. Files for plastics may be ordered without the light coating of oil. When ordering such files, it should be specified that the files are to be furnished with a "dry finish."

Files for Flash Removal

Mill files in the Bastard and Western cuts are used extensively to remove the flash from flat or convex surfaces of molded parts, and on the corners and edges of sheets to remove the burrs from previous sawing operations or for beveling the corners. One of the most widely used files is the 8" Mill Bastard. The Western cut is slightly coarser than the Bastard cut. These are relatively fine single cut files and will leave a very good finish, yet quickly remove light flash and burrs. Special plastics files are also manufactured. One type of special plastics file is a Double Ender file that is cut from the ends towards the center, thus providing four filing surfaces. No handles are required with this type of file. These Double Ender files are generally made from steel having either Mill or Warding cross section and usually are single cut. One type of such file is designated as a Button file and is made in lengths from 6" to 10". Half Round files in sizes from 6" to 8" are used on concave surfaces. Both American and Swiss Pattern files are used in the degree of coarseness necessary to meet the requirements as to stock removal and finish. Various shapes of Swiss Pattern files in cuts from No. 00 to No. 4 are used for filing small, intricate moldings. These various shapes of small files are necessary frequently because of narrow quarters or the inaccessibility of the surfaces to be filed.

(a) 8" MILL BASTARD FILE
(b) 8" BUTTON FILE

(To be continued next month)

NICHOLSON FILES FOR EVERY PURPOSE NICHOLSON U.S.A.

Make Out Your Requisitions Now

With the approach of the fourth summer of war, shortages and limitations of tools, equipment, and materials for the school shop are likely to be greater than they were before. Reconversion will come slowly regardless of the war developments of the next 90 days. Considerable delays in the release of civilian goods must be anticipated, and little or no immediate relief can be expected in this regard.

Providing proper shop facilities for public elementary; junior, senior, and technical high; and part-time and full-time vocational schools for the coming year not only involves general upkeep but in many cases a complete rehabilitation of existing provisions. Worn out, obsolete, and defective tools and equipment must be replaced, shops must be redecorated, and in some cases entirely remodeled.

To meet conditions such as these, it is necessary to start early on the requisitioning of the needed materials so that the work of rehabilitation can proceed promptly during the summer months.

Unless you are already in touch with your regular sources of service and supply take up your rehabilitation problems with them immediately. The advertisers in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION offer both information and guidance in providing for your needs for the coming school year. Make use of the inquiry form included on page 53A for obtaining buying information and service.

JOHN J. KRILL,
Business Manager

Articles, Please

Some of our readers have asked us to publish articles on farm shops; also articles on the repair of farm machinery and farm equipment in general, such as plumbing installations, hand power pumps, and electrical and refrigeration equipment. We have also been asked for welding projects that are not of the usual exercise type. Shop teachers are invited to send us articles on these various subjects.

Seventh War Loan Drive

The schools have done such a remarkable job in helping to put across the Sixth War Loan Drive that the war financing officials insisted on setting the dates for the next drive for May 14 to June 30, so that they would be sure to get the full benefit of school participation.

Start organizing your Seventh War Loan Drive in your school shop now.

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Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879.

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Published monthly except during July and August.

Subscription Information. — Subscription price, $2.50 per year, payable in advance. Canadian postage, 50 cents. Notice for discontinuance of subscriptions must reach Publication Office in Milwaukee at least 50 cents; Foreign Countries, 50 cents. Copies not over three months old, 35 cents; more than three months, fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

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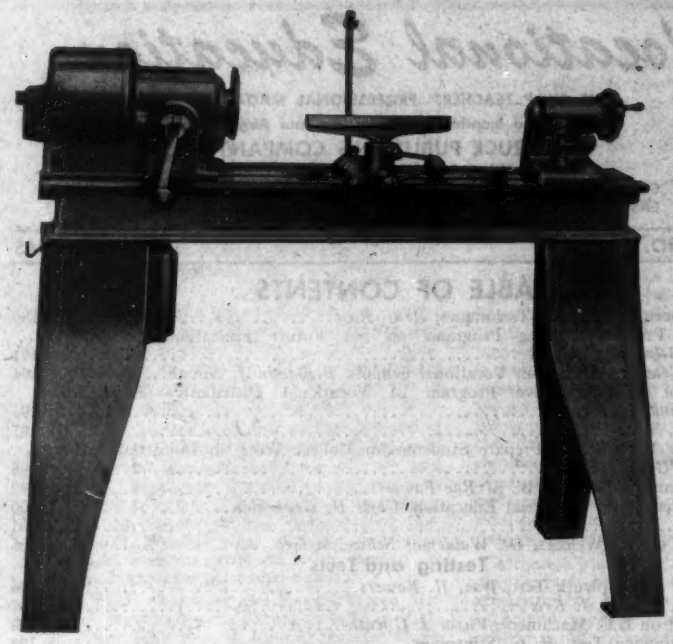

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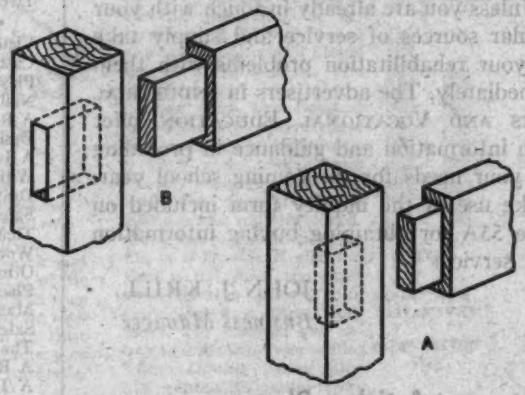

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Instruction Sheet on Teaching Techniques

*Lt. (jg.) H. C. Rose, U.S.N.R.**

All attempts at measurement and control of classroom and shop teaching procedure should be thoroughly understood by all concerned. The teacher should know what the supervisor is attempting to do and how it will be done. This is explained in the instructor training course at Amphibious Training Base, Little Creek, Va. However, the following instruction sheet is given to all teachers to promote better understanding of the rating sheets and to improve instruction in general.

Techniques of Teaching

The standard rating sheet shown in Figure 1, which is marked by the instructor trainer after each class visitation, contains 22 items. Each of these items represents a summary of many specific techniques that must be considered in all good teaching. A list of these specific techniques is attached for the purpose of:

1. Giving each instructor a more definite idea of what the instructor trainer looks for during class visitations.
2. Providing a refresher course on material studied in the instructor training course.
3. Providing a self-inventory sheet for all instructors as to their performance as teachers.
4. A ready reference to aid instructors in becoming more skillful.

Reading about these techniques will not improve instruction; however, the thoughtful application of these ideas to a variety of teaching situations will increase the effectiveness of the instructor's work and *shorten the war!*

1. *Light, heat, ventilation*

Did instructor do all he could to:

a) Have room properly heated?

b) Keep room well ventilated?

c) Make the best use of available light?

d) Keep room clean and orderly without limiting worth-while activity?

e) When using projection equipment, avoid sacrificing ventilation by not trying to achieve a greater degree of darkness than necessary?

2. *Student arrangement*

a) Could all trainees see and hear?

b) Were students moved when this would provide a better learning situation?

c) Were students kept as comfortable as facilities permit?

d) During demonstrations was a means provided to keep students from gradually working forward until some could not see or hear?

e) Was trainee group, when outside, arranged so as to be in the shade and/or facing away from the sun?

f) Were the less advanced trainees seated at the front of the room?

g) Were front seats filled first and all seats filled from front back?

h) Were seats arranged properly before the group reported to the room?

3. *Distractions*

a) Were charts, models, and other training aids stowed when not in use?

b) Did instructor discourage interruption by other school personnel during the class?

c) Was gear ready and placed so that it would be used with minimum disturbance?

d) Did instructor stay in the classroom except in cases of emergency?

e) Was class started and dismissed on time?

f) Did the instructor prevent students from moving aimlessly about the classroom and from leaving the room during the period?

g) Did all men enter class on time? — No late entries from sick bay, etc.?

h) Was instructor in the room prior to the arrival of the class?

4. *Voice*

Did instructor:

a) Speak loud enough without shouting?

b) Keep tone of voice friendly?

c) Speak with enthusiasm?

d) Speak clearly and with careful selection of words?

e) Use his voice to give emphasis (such as pausing before and after important points)?

f) Use the correct pronunciation of words?

5. *Appearance*

Did the instructor:

a) Dress properly for the job?

b) Present neat appearance?

c) Appear clean shaven?

d) Keep good posture?

e) Refrain from eating or chewing during class?

f) Keep fingernails clean and *short?*

g) Have teeth and mouth in well cared for condition? Have a bad breath? This is a serious handicap to an instructor.

h) *Wear his uniform so it reflected a good attitude?*

6. *Poise and mannerisms*

Did instructor:

a) Avoid habitual gestures that were without force or meaning?

b) Control temper at all times?

c) Set a good example of work habits?

d) Seem to be rested and ready for the days work? A man who cannot keep in good physical condition is apt to be irritable and of little value as an instructor.

e) Seem to be cheerful and not a "chronic griper"?

f) Face and talk to the class?

7. *Have an approved lesson plan and follow it*

a) Was lesson plan up to date?

b) Had instructor marked his own copy to aid him in using the plan?

c) Was the objective of the lesson used as a guide for the discussion?

d) Were deviations from plan justified?

e) Did plan show evidence of continual revision and improvement?

f) Was plan detailed to indicate arrangement of students, time schedule, how to use training aids, and the like?

8. *Introduce the lesson adequately?*

a) Did the instructor test the group's knowledge with well-planned questions?

b) Did he tell what information and what degree of skill was to be learned in the lesson?

c) Did he emphasize the *need* for knowing the information and skills to be learned?

d) Was he able to illustrate how content of lesson will be used at sea either from his own past experience or that of others?

e) Did he tell the trainees during his introduction to the lesson how the class was to be conducted?

f) Was the instructor's name lettered on the blackboard or posted at front of room?

g) Did he sell himself and his subject?

9. Use a step-by-step presentation?

*Officer in Charge, Instructor Training Program, Amphibious Training, *U. S. Atlantic Fleet*, A.T.B., Little Creek, Va.

Acknowledgment is made to Lt. (jg) M. B. Callahan, Instructor Training Officer and other members of the instructor training staff with whom these techniques of instruction have been discussed.

A. In teaching principles by illustrated lectures did the instructor:

1. Give a good introduction and student warmup?

2. Build on students' previous knowledge?

3. Bring out each idea in logical sequence?

4. Clearly explain relationship of one idea to the next?

B. In teaching an operation or manipulation by *demonstration:*

1. Did instructor do and tell?

2. Did instructor then do while students told?

3. And then did students do and tell?

4. And finally did students *do* under supervision?

10. *Emphasize key points of lesson.*

Did instructor:

a) Go over main points more than once?

b) Drill on those points that *must* be known?

c) Ask challenging questions so that trainee had to think through on basic principles?

d) Use training aids and blackboard?

e) Explain new terms?

f) Use personal experiences or stories to emphasize points?

g) See that note taking was significant and not just "busy work"?

h) Insist on proper note taking on the part of all trainees?

i) Show trainees how to record notes on main points in lesson? In general, it is effective to give trainees a mimeographed sheet of basic notes and then to direct them in making additional notes and comments on the sheet.

11. *Make use of proper questioning procedure*

a) Did instructor direct the question to the class as a whole first, pause, and then call on specific trainee to answer? Did he insist on individual responses to questions? — not chorus answers.

b) Did he evaluate answers and emphasize correct responses?

c) Were most questions prepared in advance and written out?

d) Were questions clear, brief, and challenging?

e) Did instructor contact as many trainees as possible? Trainee should be called on individually and *by name* from the muster list.

f) Did he insist on accurate, complete answers?

g) Did the instructor call on students at *random* rather than follow an alphabetical list or seating arrangement, or the like?

h) Were questions used all through the lesson?

i) Did instructor show ability to frame questions extemporaneously to clarify dubious points or to follow up when questions were partially answered?

12. Provide for student to *"learn by doing"*

a) Did instructor ask questions at proper checking or measuring levels?

b) Did he require trainees to take notes on key points in the lesson?

c) Were trainees given problems to solve and the results thoroughly checked for errors?

d) Were problems introduced that made use of facts taught in lesson and which made the trainees *think* in order to apply those facts?

e) Did instructor stay with the student after correction is made to make sure that the right way is put into practice?

f) Did instructor give trainees something definite toward which to work?

g) Did the instructor secure maximum student participation and drill without sacrificing other important phases of the lesson?

h) Did instructor let student do operation without "taking over" himself when difficulty was encountered?

13. *Utilize summaries and effective repetition*

Did instructor:

a) Repeat important points of lesson?

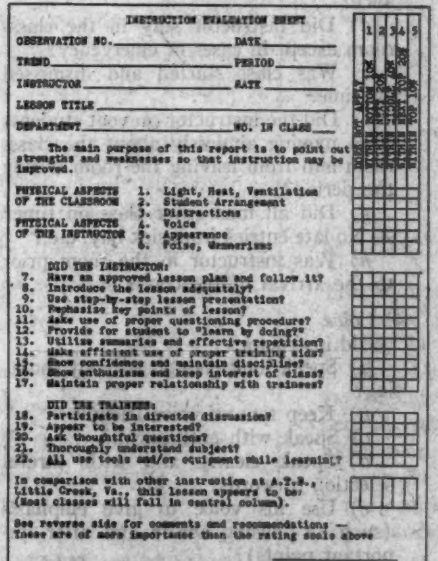
b) Question students on what has been seen in films?

c) Write unfamiliar words on blackboard?

d) List important steps of procedure on board or use charts? This will help student to take accurate notes.

e) Summarize the main points of the lesson before dismissing the class?

f) Make use of competition between individuals or groups as the means of keeping student interest during practice and drill?


INSTRUCTION EVALUATION SHEET

OBSERVATION NO._____ DATE_____

TREND_____ PERIOD_____

INSTRUCTOR_____ RATE_____

LESSON TITLE_____

DEPARTMENT_____ NO. IN CLASS____

1 2 3 4 5

The main purpose of this report is to point out strengths and weaknesses so that instruction may be improved.

PHYSICAL ASPECTS OF THE CLASSROOM
1. Light, Heat, Ventilation
2. Student Arrangement
3. Distractions

PHYSICAL ASPECTS OF THE INSTRUCTOR
4. Voice
5. Appearance
6. Poise, Mannerisms

DID THE INSTRUCTOR:
7. Have an approved lesson plan and follow it?
8. Introduce the lesson adequately?
9. Use step-by-step lesson presentation?
10. Emphasize key points of lesson?
11. Make use of proper questioning procedure?
12. Provide for student to "learn by doing"?
13. Utilize summaries and effective repetition?
14. Make efficient use of proper training aids?
15. Show confidence and maintain discipline?
16. Show enthusiasm and keep interest of class?
17. Maintain proper relationship with trainees?

DID THE TRAINEES:
18. Participate in directed discussion?
19. Appear to be interested?
20. Ask thoughtful questions?
21. Thoroughly understand subject?
22. All use tools and/or equipment while learning?

In comparison with other instruction at A.T.S., Little Creek, Va., this lesson appears to be: (Most classes will fall in central column).

See reverse side for comments and recommendations — These are of more importance than the rating scale above

Observer

Fig. 1. Rating scale. The major objective of the rating sheet is to point out weaknesses and strengths so that the instructor has specific and detailed information on how to improve his teaching techniques. Specific comments and recommendations are always made on the back of the rating sheet

14. *Make efficient use of proper training aids*

a) Was presentation of aid written into lesson plan?

b) Was material arranged for smooth, easy presentation?

c) Was extraneous material out of sight during class?

d) Did class remain in same room to use aid?

e) Did value of aid justify time spent using it?

f) Were mechanical devices *operating* properly?

g) Were mechanical devices *operated* properly?

h) Could *all* students see and hear?

i) Was aid adequately introduced?

j) Did the aid help to meet the lesson objective?

k) Was the aid followed up with summary and/or questions?

l) Had all extraneous material been deleted?

m) Was aid used to proper advantage *all through* the lesson?

15. *Show confidence and maintain discipline*

Did instructor:

a) Seek causes of trainee's action before reprimanding?

b) Reprimand with justice and tact?

c) Remain consistent in disciplinary action?

d) Consider student's mental and physical condition?

e) Avoid disciplining the group for the acts of an individual?

f) Avoid all arguments?

g) Stay calm?

h) Speak with authority?

i) Have and use the facts?

16. *Show enthusiasm and keep interest of class*

Did instructor:

a) Use showmanship?

b) Use colorful and yet accurate language?

c) Stay on his feet and in a position to demand attention?

d) Use meaningful gestures?

e) Know his subject so that he was sure of himself?

f) Stimulate discussion but remain in control at all times?

g) Employ humor when it would add to the lesson?

h) Change the pace of speaking where it would make the lesson more interesting?

i) Appear interested in the subject and in the job of teaching?

17. *Maintain proper relationship with trainees*

Did instructor:

a) Try to understand trainees?

b) Avoid sarcasm and ridicule?

c) Refrain from being "one of the boys"? (Fraternizing)

d) Give credit for good work?

e) Attempt to judge the trainee on what he is doing today rather than on his past record?

f) Try to be a good sport but maintain sufficient reserve?

g) Eliminate profanity and unfavor-

able references to beliefs that may be sacred to others?

h) Use informal methods — yet hold the respect of the class?

18. through 22. *Did the trainees:*

a) All participate in directed discussion?

b) Contribute ideas?

c) Appear interested?

d) Ask questions that indicated thought on the lesson?

e) Answer questions in full and with apparent understanding.

f) All use tools and/or equipment while learning?

g) Voluntarily have their work checked by the instructor?

h) Seem anxious to develop skills?

i) Show appreciation for equipment properly used?

Influence of Present Training Programs on Our Future Educational Activities

*Harry S. Belman**

No discussion of problems which will arise in the near future, and particularly after the cessation of hostilities, can be adequate without some reference to the basic problems of the future which will affect all phases of our activity, whether they be training, production, or any other with which we may come in contact. It is necessary, in an article of this kind, therefore, to present briefly some considerations and speculations as to the types of postwar problems with which we may be faced.

It is, of course, difficult to make any accurate statements or predictions as to what may take place, for a number of reasons: (1) no one really knows when the war will end; (2) the kind of peace terms which will be drawn up cannot at the present time be definitely stated, although there is discussion on many phases of this problem; (3) the attitude of the countries and the peoples involved in this situation at the time of the close of the war is certainly unpredictable now; (4) the economic aftereffects of the war cannot be entirely envisioned. Any person, therefore, who attempts to make statements regarding postwar problems leaves himself open to considerable debate regarding his own views, because there is such a divergence of opinion regarding such matters. However, it is necessary that we do make some basic assumptions regarding postwar conditions.

The first of these is as to the conclusion of the war, and it is probably safe to say now that hostilities may cease entirely in all theaters of operations by 1946. We can use that date for purposes of discussion, as the beginning of a period of postwar development and reconstruction.

Second, I think we can say that there will be an increase in the number of people available for working activity. In other words, the labor force will probably be considerably larger. We know that in 1940 the total labor force of this country consisted of 52,842,000 persons; but in 1946, it is estimated by competent authorities that, due to the trend of population growth in the group between the ages of 20 and 64, there will be a labor force of approximately 56,718,000. With such a labor force we will have a potential productive capacity which can be expressed, in terms of 1940 prices, at a yearly value of 142 billion dollars. The problem of harnessing and utilizing this productive capacity is certainly one of the most vital facing us, even today in the midst of our tremendous war effort. The future well-being of this nation rests, in a large part, upon our ability to keep the labor force actively and purposefully employed.

The third basic assumption that we can make in this discussion is that our postwar political organization will, in all probability, be a "middle of the road" type of government, which will not be in favor of an economic program of the "free for all" type, but which will also not provide for extreme social control, although there is every indication that the people themselves expect a great deal more participation by the government in matters of social security, public works, education, and the like. There is very little doubt that much more attention will be paid in the future to the problems of setting up large-scale public works and other similar activities as a means of cushioning the cyclical periods of unemployment and economic inactivity that strike private enterprise.

We may well ask ourselves the question as to what are some of the elements and problems of the postwar situation that demand our consideration. The fundamental problem as a whole is that of readjusting society as quickly as possible from a wartime basis, with its concentration on the production of items that will expedite the war program, to an economy and a society which is concerned primarily with the processes of making living for each individual member more desirable and more purposeful. In the latter situation the major emphasis of all of us can be placed upon efforts toward improving the arts and sciences, and all the activities which make possible a life in which the individual capacity to develop and participate is given the fullest opportunity for expression, while at the same time the interests of society as a whole are promoted. Involved in such thinking is the important individual demand, which is uppermost in the minds of most of us in a normal peacetime situation, for security and for the opportunity to work.

The process of conversion from the war effort to reconstruction will be evidenced in a variety of phases. The first of these will be that in which there may be a definite gap in the employment situation between the cessation of the war and the full utilization of the estimated labor force. In all probability there may be, for a short period of time if everything goes well, a considerable amount of unemployment as a result of several factors. For example, wartime employment brought into industry and into all kinds of occupational activity many persons who did not find employment readily during normal periods, or who were not normally in the labor market. Many of these, such as women, will probably go back to their homes and assume thier responsibilities as housewives. There may be a declining use of young people and people over certain age levels. There may also be a gap between the disbanding of the armed forces and the reemployment of veterans in civil activities.

The second step of this postwar situation is that in which the deferred demand for goods and services will provide the incentive and the basis for development of new industry and the expansion of present-day quiescent industrial activities. Not only will there be a demand for new goods, but the demand for replacement, repair, and renovation of presently used buildings and equipment will provide an opportunity for re-employment of large numbers of people. However, this step of the process will also be characterized by a concentration upon fiscal matters related to such problems as credit and the long-term financing of construction projects, and the like. The handling of such matters will require a very keen sense of the relationships between finances and production, and the distribution of the products of our industries. If this phase of the reconstruction period is mishandled, it may result in serious social and economic consequences.

The third phase of the immediate postwar situation, and the one which will vitally affect the two previously mentioned, is that of conversion of wartime industries to peacetime operations. This phase of the situation involves, among other things, the reviving of industries which have been

*Regional Chief, War Manpower Commission, Chicago, Ill.

adversely affected by the war program. Another factor which enters into this problem will be that of the methods of handling the presently government-owned facilities which may, in some sense, be a burden on society if they function so as to disturb and compete with legitimate private enterprise. Some industries will, of course, be able to convert more rapidly than others, due to a number of factors which need not be taken into consideration at the moment. Differences of opinion, however, as a result of such confusion, may cause a number of conflicting interests to attempt to bring group and special interest pressures to bear upon the whole problem of conversion, and such action may confuse the issues and delay the arrival at adequate solutions.

Therefore, the period immediately after the war, in which the problems mentioned above will be among the most important, may in all probability be one of a great deal of disturbance and conflict. It will be necessary for all of us to participate in the program of reconstruction with a clear understanding of the factors that have brought about such a situation, and the need for calm and cooperative action. There may be pressure for the maintenance of wartime controls for a considerable period during the reconstruction program. There may be demand for expansion and extension of peacetime controls, the trends of which were clearly discernible even before the war. The fact that the people indicated, in numerous surveys, in almost overwhelming numbers, that they expected government participation in many of their individual social problems points to the conclusion that we will have a terrific problem of postwar readjustment.

Many people are now and have been for some time writing about and discussing questions which deal with postwar problems. In a topic such as this there is not much place for a total presentation of such treatments. However, we must remember that there is a trend toward a greater recognition of individual rights and privileges, with the underwriting by the government of such fundamental privileges as the right to work, the right to adequate pay so that the necessities and some luxuries of life may be available to all; the right to adequate food, clothing, shelter, education, and the like. That would indicate that we are, at least, moving somewhat along the way to a more definite participation by the government in business as well as in individual activities.

Now, the question may arise as to how conditions of the kind that have just been mentioned affect education. Our own knowledge of education and its history in this country should lead us to see clearly the relationship between the support for education in a society in which there is ample employment and adequate wealth, as contrasted with what may happen in a society in which the average income is low and the standard of living one which does not require or demand a high degree of training and education. Educators therefore must be concerned with the economic and social aspects of the period in which they live, so as to utilize them for the best interests of the educational movement, and so as to integrate educational thinking and practice into and make it a part of the society which it serves.

Education will not be accepted and will not make progress unless society feels that it is beneficial to the people, and unless society is capable of supporting it adequately. Surveys in our own country have shown the contrast in educational systems between areas which have adequate wealth and in which wages are comparatively high and working conditions good, and those areas in which the average income per capita is low and the economic development is retarded. Educators must, therefore, be students of economic and social problems, and must be aware of the ways in which social and economic change influence educational practices.

The training programs sponsored by the Federal Government, which had a bearing on the preparations for war and on war production, were established before the actual beginning of our participation in the war. It was recognized early in 1940 that we might at some time or other be engaged in the war, and therefore steps were taken to prepare industry and labor for the necessary production required during a war period. Many training practices were established at that time (1940) which to some extent were a complete change from the usual educational activities of our schools. It will be necessary only to cite the characteristics of these war-training programs to give you an idea of what did occur in American education, and what is now taking place as a result of the impact of the war effort on the educational system. These are some of the characteristics of the war-training programs:

1. They are, as a rule, of very short duration and extremely intensive concentration on single elements of a subject or occupations.

2. They operate wherever necessary on a 24-hour-a-day basis.

3. They are supported completely by federal funds.

4. In the actual preparatory or pre-employment phases, very little attention, if any, is paid to instruction in related fields, or in basic scientific theory and principles which give an over-all understanding of an occupation or activity.

5. They are geared closely to the needs of specific industries and specific occupations.

6. Oftentimes the war-training programs are conducted in shops and plants rather than in schools.

7. Generally instructors in these courses are persons who are selected more for their knowledge of the subject matter taught than for their ability to instruct. As a result, a considerable amount of teacher training activity has been going on in the war-production training programs.

8. Scientific and professional fields of activity have been analyzed and broken down so that instruction is given in single elements of these fields for the purpose of providing technicians for war industries, rather than all-round professionally qualified engineers, metallurgists, chemists, and other types of scientists.

9. Definite emphasis has been given to the separation of the various phases of training in order that it may be possible to carry on training more quickly. For example, in the matter of industrial supervision, the field of supervisory techniques has been separated from the field of knowledge of job operations, so that supervisors are given programs which are designed to improve their supervisory skills, without attention being paid to their knowledge of how jobs are performed, which is a separate program carried out under auspices of a different training agency.

10. War-training courses and programs have exhibited a high degree of flexibility, and educators who have administered and supervised such activities have shown that they are able to adjust their thinking and their practices to meet conditions as they arise.

All of these characteristics, and the entire activity in the present war programs, should and will have a definite influence on educational practices in the long run, but they will affect more especially those of the immediate postwar period. It is, of course, not possible to predict all of the changes that may occur in education as a result of the past several years of war-training experience, but it may be interesting and profitable to attempt to indicate what appears to be a future trend in educational activities. These speculations or forecasts, of course, are based on the factors cited in the beginning, as well as the characteristics of the present war-training programs. No consideration has been given in this article to the college training programs of the army, the navy, and other elements of the armed services, which have been quite revolutionary in their operations. These will certainly influence in many ways the types of educational programs which we will have in the future. However, these are some of the future activities which appear to be quite certain of incorporation in the educational thinking and practices of the postwar world:

1. There will, in all probability, be a definite demand for an increase in the offering of part-time educational opportunities, both on the juvenile and adult levels, due to the fact that it will be necessary for many persons who have been trained in war-production occupations to expand their skills and to develop new skills to fit them for postwar activities.

2. Educational facilities will probably continue to be made available on a 24-hour-a-day basis, especially in the immediate postwar period, in order that those who require training for readjustment may receive it quickly and may then find employment rapidly.

3. Schools and colleges will find it necessary to engage in programs of rebuilding and re-equipping their facilities. The war-training program has been hard on present facilities, even though many schools have

been aided by federal funds in the purchase of new equipment. However, such a program of rebuilding and re-equipping will require a more realistic approach to the problem of providing training facilities, in that schools and educators will, of necessity, be required to make a closer study of working conditions, working tools, and operations before they engage in the process of securing new equipment and new facilities. A more thorough study of the entire working world will be necessary so that the new schools will provide a wider range of training opportunities for our people.

4. The recognition by the training agencies, during this war period, of the possibility of carrying on in-plant training programs, with instructors provided by public schools, will lead to a closer relationship in the future between industry, business, and the schools. It may be entirely possible that industry will turn to the schools for more assistance than ever before in such programs, through the means provided by educational authorities, rather than through the organization of plant training departments.

5. However, the trend which is now evident in industry toward the development of industry training departments and plant training programs may be further accentuated in the postwar period. This will present a distinct problem to the schools and to industry as to how the two can cooperate with each other, and correlate their training programs so that there will be no overlapping or waste motion in preparing people for their chosen work.

6. The fact that we have, in this war period, placed considerable emphasis upon short-term training and upon the concentration of training techniques on single elements of operations and occupations will, in all probability, lead us to recognize that training is a factor in every type of occupational activity, no matter how simple, or how unskilled it may appear to be at the moment. Educators may very well, then, pay much closer attention in the future to the problem of training people for entrance into the simplest occupations as a definite part of their general educational programs, since it must be recognized that the employment and economic needs of many people will be adequately met in that way.

7. In the past few years not so much attention has been paid to the training of all-round skilled workers as is usually done in peacetime periods. As a result we may find ourselves, in the postwar period, with a scarcity of skilled workers. This scarcity will accentuate the need for expansion of apprenticeship programs, and the development of related training courses for persons who are employed. The long-term apprenticeship program, however, is a fundamental factor in industrial operations, and this activity should be encouraged and promoted by educators, so that we will not be found again with a scarcity of skilled mechanics as we were at the beginning of the war effort. It is difficult to say how much of war production was impeded because of our failure to train enough skilled mechanics over the years preceding the war, but it is safe to say that it might have been considerably speeded up if we had had a large corps of such individuals in our industries.

8. The influence of the army and navy college training programs, and the present Engineering, Science, and Management War-Training program, should be felt in college activities after the war. It may result in the acceleration of college courses to a large extent, and it may also bring about a clearer understanding of the importance to industry of persons who have had only a short-time semiprofessional or semitechnical education. Too much emphasis has been placed, in the past, on long-term educational programs for all persons who attended institutions of higher learning. Industry today is finding, however, that many persons fit into its production patterns more advantageously because they have the definite and specific technical skills which were secured through short-term, intensive, concentrated training in semi-technical or semiprofessional occupations.

9. Certain other fields of activity, outside of the industrial, must receive a greater share of attention by educators. There will probably be a great demand and need for education in the homemaking field by many young women who married during the war period and were employed, with the result that they did not give adequate attention to their household responsibilities. As a result, many young women were not properly prepared to be housewives, and they will find themselves greatly in need of such training. With proper promotion and well-trained staffs, schools can make available to the average housewife and mother a considerable fund of knowledge and training which will assist her in operating a home more efficiently and attractively.

10. The service occupations and the entire field of distribution have never fully received services from educational institutions, and have been neglected to a very large extent during this war period. Persons employed in those fields will require retraining and readjustment, while many of them will want to leave for other fields, and many persons will want to return to these fields from their war occupations. Statistics show that there are as many, or more, people employed in distributive and service occupations as in industrial production occupations. The postwar period will make these occupations more important from the point of view of numbers employed, and probably more attractive to many people. Educators, therefore, must not neglect the opportunities which will be open to them to serve this large field of occupational activity.

11. The close correlation between industry and training agencies during this war period should carry over into the future, so that schools will be called upon to provide a greater variety of training facilities to meet the needs of future industrial, business, and other activities. In many cases there will be the opportunity to organize cooperative training programs, in which equal periods of time will be spent at work and in the school environment, and each party in the program will supplement the activity of the other, so that the worker who finally completes his training will be of greater value to himself, as well as to his employer.

12. The operation of the short-term college programs and courses during this war period will provide the incentive for the expansion of college offerings through extension activities and other similar opportunities for people to study such courses on a non-credit basis. Because of this probable widespread demand, colleges will have an opportunity, in the future, in the offering of noncredit subject matter courses which may far outstrip the traditional offerings of present-day collegiate institutions.

13. The trend toward greater government participation in the everyday affairs of the people and the possible closer relationship between nations in the postwar period will make it necessary for educators on all levels to offer more comprehensive training in world affairs, history, science of government, languages, and the like. It may be necessary to offer, in our high schools and colleges, more courses of a preprofessional nature, preparing people for public service occupations both in our country and abroad. This type of future activity will require that educators and schools make themselves increasingly aware of political and social conditions, both at home and abroad, and it will necessitate their constantly studying in these fields in order that they may prepare our future citizens to handle these problems more effectively.

14. Population trends before the war indicated a material increase in the adult population between the ages of 20 and 64, and a decline in the group under 20 during the period between 1940 and 1950. The great increase in marriages during the war period may, to some extent, halt this trend; but in the long run it will reassert itself and we will find ourselves faced with a much larger adult population than a juvenile one. The increasingly complex problems of a political, economic, and social nature with which we will be faced will, therefore, require more attention on the part of educators to the field of adult education. Many of the predictions as to future educational activity already mentioned fall within this field. But the education and training of adults requires different techniques and a different attitude on the part of educators. It is a field apart from the usual high school or college education, even though the term *adult* may designate any individual who is not enrolled full time in a school program. Oftentimes the mistake is made of considering the vocational school as on the secondary level. However, in the approach to the offering of educational services, it is well to give thought to the question of whether or not a young person who is employed is really

an adult, and should be treated as an adult in his efforts to secure an education. With that premise in mind, it seems that it will be necessary to give thought to the organization of educational environments, practices, and techniques which will fit adult attitudes and responsibilities. School or training hours must dovetail with working hours, equipment must be comparable to that actually used in adult working situations, instructors must have the adult viewpoint, and the school procedures must take into consideration adult impatience with excessive attention to credits, prerequisites, forms, and the like. Provision must be made now for comprehensive and sympathetic study of adult attitudes, mental capacities, and specific abilities, in arranging courses and programs of study.

15. Finally, it can be predicted with a fair degree of accuracy, that there will be a trend toward increasing the period of school attendance for young people, since there may be a surplus of adults in the labor market who will be given preference for employment. This represents a trend which was definitely on the increase before the war, and which will reappear after the war. This condition will present a challenge to educators, especially on the secondary and on the vocational levels, to provide courses and programs that will be vital, stimulating, and practical, so that our future generations will be well prepared to grapple effectively with the problems of their times.

Methods of Teaching Science in Vocational Schools

*Benjamin J. Novak**

The preoccupation of the vocational schools with the nearly overwhelming task of developing course content has permitted little attention to be spared for consideration of teaching methods and techniques. Vocational education has become sufficiently mature to permit an increasing and long overdue share of effort to be directed now to such matters. Controversy still rages as to what really should be science, related science, or whatever one wishes to designate the instructional material. This should not, however, cause other things to be neglected.

By way of introduction, it seems desirable to consider some of the factors which often operate to make the task of science instruction in a vocational school difficult. The long school day and large number of classes (although classes usually are of moderate size in comparison to those in many high schools), in themselves impose a heavy burden upon the teacher. The instructor, furthermore, may be responsible for meeting students on all grade levels within a trade, or meeting different trades on the same grade levels.

Sometimes both conditions, especially in smaller schools, are combined. The consequence is the necessity for a wide area of preparation. Considerable study, and even participation in the trade are desirable to enable the instructor to make intelligent trade application of scientific principles. During this period of national emergency, summer or other part-time experiences are abundantly available. The observant and energetic teacher does not need necessarily to attain any advanced performance level in the trade in order to secure this benefit. If the science instructor is also the shop teacher, he will usually be rich in shop experience, but probably limited in special techniques of science instruction. Sound trade applications serve to motivate and justify learning. The student generally has a strong primary interest in his shopwork, and this interest should, and must be enlisted.

Our student population in vocational classes characteristically is heterogeneous in the extreme. Often the students are drawn from a wide geographic area, increasing the possibility of variation in previous scholastic experience. Individuals in the same class may have transferred from other schools at varying grade levels above the minimum set for entrance into the vocational school.

Variation in age and maturity often are considerable.

In most areas the normal progression is from elementary or junior high to high school. The vocational school represents an offshoot, or indirect educational path. As a consequence, many of the students find their way to the vocational school as a last resort, finding personality, reading, and other scholastic obstacles impeding them in the senior high. Faulty counseling, from many quarters, direct "problem" students to our classes. Although there is much that can be done in vocational schools (and other educational institutions for that matter), the vocational school organization and facilities are intended for handling the so-called "normal" student. Underprivileged young people of many types, handicapped economically, parents negligent, some residing in orphanages or other institutions are frequently, and with reason, directed in large numbers to our doors. Many are possessed of satisfactory aptitude to master readily a trade and become successful wage earners upon completing their courses. Many of these, however, present emotional problems which often interfere with the learning process, and must be given special attention, often inadequately, by the instructor.

Methods of instructions are, of course, directed toward developing each learner as effectively as possible in knowledge, skills, and habits of thought.

The less heterogeneous the teaching group, the more effective it is possible for methods of class instruction to become. Rosters might be examined more critically with the thought of making classes more homogeneous. The matter of homogeneous grouping has not been given much attention generally in the vocational education programs, although the problems, especially in smaller districts, are complex.

With difficulties such as these which have been enumerated, it is perhaps not to be wondered that few vocational schools have shown to advantage in practicing or developing teaching procedures in classroom subjects.

Methods of Instruction

Rather than selecting and advocating any one method to the exclusion of others, it is probably more useful to present several, reviewing the apparent advantages and weaknesses inherent in each.

1. *Individual Written Units or "Contracts":* This appears to provide the most individualized approach, and is employed by many science instructors in vocational schools. Shop instruction necessarily consists of individual jobs and projects, with the student proceeding largely at his own pace. It is logical that a similar plan operate in the classroom. Theoretically, almost any type of student may be assigned to any class at any time, providing that the instruction sheets are available. The student tends to develop some self-reliance through being responsible for his own efforts and progress, although widespread copying may be common.

Although the advantages of this method are apparent and real, several disadvantages suggest themselves. In the first place, the emphasis is heavily upon factual mastery, it being difficult to develop attitudes, understandings, and the *scientific thinking* some deem so essential. The personality of the teacher is "diluted." It is argued with some justification that group participation and social development are provided for satisfactorily in social studies and other so-called "cultural" subjects.

It is extremely difficult to provide laboratory experiences, the instructor being

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preoccupied with other phases of instruction.

Heavy emphasis is placed upon reading. Many vocational school students are not *readers*, in fact some have serious reading difficulties which prompted them to leave the more academic schools. At best, motivation tends to lag.

The task of writing instructional sheets is difficult and time consuming, requiring considerable initiative. Some districts provide *curriculum construction* time for instructors, others offer salary increments. Understandably, the average instructor is not overly provided with the experience and facilities required to write clear and effective instructional material. The practice of direct copying and reproduction of whole sections from textbooks cannot be justified. Often sheets are poorly organized, and imperfectly mimeographed or reproduced. The constant use of confused, illogically prepared instruction sheets is an uninspiring experience for the student.

2. *Textbook Instruction:* Some vocational education systems have allotted little or no funds for the purchase of textbooks. The opinion has been general that this traditional type of instruction is to be avoided. In most instances, a few of a variety of texts are purchased for reference use with instruction sheets. Many textbooks at present available for science offer vocabulary difficulties or generally are not adaptable for vocational school use. Newer textbooks intended for vocational classes are now appearing, some of which are very commendable, and others present the semblance of superficial and poorly organized work.

Even at best, most educators do not consider it desirable to place too much reliance upon textbook instruction. It seems advisable, however, to expand textbook use as much as possible as more suitable texts are developed, thus relieving the instructor of part of his burden. Although the vocational school day is long, it seems educationally sound, from many angles, to expect a reasonable quantity of home study. The issuance of textbooks to students for home use is helpful in this connection.

3. *Laboratory Procedures:* Many of our vocational science departments are very meagerly supplied with laboratory facilities, equipment, and supplies. As mentioned earlier, the written contract type of instruction does not lend itself readily to laboratory work. Although research studies based upon achievement test results are not especially encouraging, some educators are strongly convinced of the value of student participation in laboratory work as an aid to understanding scientific principles, developing manipulative skill, and motivating learning.

Students working in groups frequently can assist each other in learning, the more capable often serving as a sort of assistant teacher somewhat reminiscent of the old so-called "monitorial system." It might be observed that there is considerable informal learning of this sort in the shops and in daily life, which instructors might with profit seek to utilize in the science class. In work of this sort care must be taken that a few more energetic individuals do not perform most of the activity while others play a passive part. Laboratory participation does not permit *coverage* of as much instructional ground as other methods of instruction, and entails considerable labor in preparation. Care must be taken not to duplicate trite experiments having little value. Students can construct in their shops with educational benefit many useful items of equipment. Much of the standard elaborate chemical and physical apparatus may be omitted entirely, although some essentials should be purchased. Laboratory demonstrations are more economical of time and expense, and in some cases preferable to other methods of instruction. The shop teacher who serves also as a science instructor may find himself unfamiliar with some types of standard laboratory apparatus and experiments, and will find it necessary to direct extra attention to them. The plea might be offered here to vocational administration to provide science instructors with extra preparation periods to enable them to get special equipment ready without loss of instructional time. A few fortunate school districts employ specially qualified nonteaching assistants, who devote their attention to this work.

4. *Lectures, Questioning, and Recitation:* These need to be mentioned only in passing. All teaching involves some measure of telling, giving instructions or information, and asking questions. Formal lectures as such play a small, but in some cases, necessary part in instruction. Questioning and answer techniques judiciously used are often overlooked as means of developing the student. One is frequently surprised at how far the thinking of even a backward student can be expanded with careful and patient questioning. Most students, and sometimes instructors, think of teaching as being *telling* but little more. The questioning technique is difficult, and might be said to possess many of the attributes of an *art*.

5. *Test Methods:* Tests can scarcely be considered a method of instruction, but it may be useful to think of them in that connection. When individuals work on instruction sheets at their own pace, it is commonly expected that some arbitrary standard of achievement or mastery shall be attained before proceeding to the next unit. When other instructional methods are utilized, tests are offered and the student *passed* or *failed* on a single experience with each test. It is possible to think of tests as instructional devices, as well as prognostic, diagnostic, and marking instruments. Alternate forms of test on small sections of work may be developed, allowing repeated trials until sufficient mastery is attained. The tests then serve more as a learning device rather than simply an instrument of classification.

6. *Visual Methods:* Great enthusiasm has been developing in *visual education*, so styled. Through advertising and other pressures it has assumed the near proportions of an educational *fad*. This is reflected in the requirements by many states which make visual education courses prerequisites for educational certificates.

Visual education is important, but education is a process involving all sensory avenues. The emphasis upon one to the comparative neglect of the others appears unfortunate. Much is heard about the remarkable educational results obtained by the army, navy, and other wartime agencies through the use of motion pictures. When funds are available to provide special films for specific teaching situations the results may be gratifying.

In the vocational school films are useful generally as a tool of instruction, being valuable for introduction and review, helping also to motivate learning. Many of the films available, however, may be adapted imperfectly to varying classroom needs, and can scarcely be expected to assume the status of a *method*.

The place of the blackboard, bulletin boards, graphs, charts, models, displays, still films, slides, and the like in effective teaching need scarcely be mentioned.

7. *Project and Other Methods:* Shop or other school projects may often be integrated with science instruction. A portion of science instruction may be needed which is not scheduled to be taught at the time, but the enthusiasm and need of the student combine to make cooperation and exertion on the part of the science instructor productive of rich results. Although planning is necessary, flexibility likewise is indispensable.

Enormous masses of materials in bewildering profusion are available without cost from manufacturers, some of which are readily applicable to science instruction in vocational schools. A number of corporations have even set up *educational departments*, staffed with *educational advisers*. These make available pamphlets, sample materials and films. Obviously the motive is advertisement and business good will. In some districts administrators have discouraged or prohibited the use of such materials. When employed with great care and discretion, however, they enrich instruction and keep instructors informed of new developments. It seems desirable also to bring those sources to the attention of students, in order that they may draw upon them later for themselves.

When pertinent materials of contemporary interest are found in newspapers, periodicals or elsewhere, it may be found most useful to introduce them from time to time in the form of *current science* lessons.

Conclusions: All of the methods enumerated, as well as others not mentioned, have a place in instruction. Many instructors fall into an educational *rut*, after hitting upon an instructional method that appears successful. The method should vary with the class and type of material taught. Most instructors seem to be much more successful in handling some techniques than they are in others. It behooves each instructor to examine and analyze periodically his own approach. The results often are surprising. Many teachers in

vocational schools have students in classes over an extended period. These students soon learn the educational and personal habits of their instructor, and may develop behavior patterns which are far from being satisfactory. A little experimentation and thought in the matter of method may be productive of unexpectedly good results.

Evaluation of a Cooperative Program of Vocational Distributive Education

*Murray Banks**

Before organizing the cooperative part-time program of distributive education in the high school of Millville, N. J., a comprehensive study was made to ascertain the need for distributive education in that community. This study included an analysis of where Millville students find employment, an occupational survey of the school population and of graduates, a survey of the local stores, and the vocational opportunities in retailing, together with students' interests in this field as an area of occupational endeavor.

A part-time program of vocational training which involved close co-ordination of the instruction with the experience of the learner was developed. This program met the requirements for re-imbursement under the federal George-Deen Act. A group of 26 high school seniors spent their mornings in school and devoted their afternoons in job training at the local stores. An hourly wage was paid the pupils for the out of school time in accordance with the regulations of the George-Deen Act.

At the conclusion of the first year of cooperative training for distributive occupations the results achieved were carefully evaluated.

Evaluating the Results Achieved

The value of any program of distributive education should be measured by the degree to which it increases the efficiency of those enrolled in it to perform the activities required of them on the job.

Mere personal enthusiasm and belief in a type of training do not prove its worth nor its practicality. The time that a type of training has been in use does not always prove its effectiveness. The presence of a traditional cooperative part-time course of training in the curriculum does not prove its value in meeting the needs of students, society, and merchants. A sound evaluation of any program is based upon facts. This article, therefore, will present the method used and the findings of an evaluation of the cooperative program which was made at the conclusion of the first year of training.

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Pupil Evaluation of the Training

The students enrolled in the cooperative course were interviewed and asked to complete a questionnaire which asked the following questions:

1. List your reasons for taking the cooperative course in retailing.
2. What is your opinion of the need for such training?
3. What is your opinion of the value of the training for making successful, efficient retail workers?
4. What would you say are the advantages of the training to the students?
5. What would you say were the disadvantages of the training to the student?
6. What other comments about cooperative training for retailing can you make?

The reasons most commonly mentioned by the pupils for enrolling in the cooperative course in retail selling, in order of frequency of mention, were as follows:

1. Desire to acquire practical training
2. Interest in selling
3. Desire to earn money

The students believed that the training had certain definite advantages which may be summarized as follows:

1. The student gains certain guidance values due to the fact that he has the benefit of a natural method of choosing an occupation, since the type of work he should follow is determined by: (1) contact with actual store work; (2) practical tests of his own inclinations and adaptability; (3) intelligent participation in the shaping of his own preliminary training. (These values were mentioned by 20 out of the 26 students replying to the questionnaire.)

2. The student acquires certain educational advantages as the training: (1) combines theoretical and practical store training and gives students an opportunity to see the school instruction connected with real-life situations; (2) makes the schoolwork more interesting, since the pupil sees the need of the school instruction when he is placed in a store position; (3) develops sales ability, teaches technical knowledge of the occupation, and develops job intelligence, all at the same time; (4) offers the student desirable training in English, related mathematics, store management, and business psychology; (5) gives the student practical experience with high school credit for it. (These advantages were mentioned in some form or another by all the students replying to the questionnaire.)

3. The student acquires certain social advantages, as the contacts with store personnel and the shopping public develops the social intelligence of the student: (1) the student must learn to adjust himself to various groups of people; (2) the student will need to pay especial attention to such factors as health, personal cleanliness, dress, and social behavior. (These social advantages were mentioned by 22 students replying to the questionnaire.)

4. The student acquires certain disciplinary values: (1) the students are dealing with merchandise and people and must assume the responsibility for making sales; (2) the student must develop poise and dignity of bearing in order to compete with older salespeople; (3) the store demands 100 per cent efficiency. (These advantages were mentioned by 15 of the students.)

5. The student acquires certain economic values: (1) the training offers opportunity for entrance into the business world at an early age without giving up the advantages of high school training; (2) the student is enabled at least partially, if not wholly, to support himself while taking the training; (3) the student acquires a background from the training so that promotion in later years following graduation should be easier. (These advantages were mentioned by all the students replying to the questionnaire.)

It is interesting to note that a number of the values mentioned by the students may be classed as nonvocational, or not of a direct vocational nature. Guidance values were frequently emphasized by the students in evaluating the training.

In discussing the emphasis placed upon the nonvocational values, one writer states:[1]

Although the objectives of the course are ostensibly to train for some vocation in the retail field, many other factors enter into this choice. And since many of the distressing failures in business are due to personality factors rather than lack of intelligence, a good deal of attention is given, indirectly and in the curriculum, to building up sound constructive thinking habits, emotional stability, and ability to cooperate with others.

Although vocational values were primarily emphasized, it should be recognized that guidance plays an important part in bringing to the student some contact with the business world. These contacts are valuable in assisting the student in making his future vocational choice.

There was a strong feeling among the students who had taken the training, of the need for such training to produce more efficient workers. These pupils all believed that their training had made them more efficient and valuable to their employers.

It was suggested by a number of the pupils that a program of cooperative training be made more generally available to more of the school population.

They believed that their training advantages centered around the vocational opportunities afforded by cooperative training, and believed that the disadvantages centered around their inability to engage in school activities. Several of the pupils mentioned as a disadvantage the unsympathetic attitude of other teachers.

Evaluation of the Training By Merchants

A questionnaire was also submitted to

[1]Amanda R. Rohde, "The Cooperative Retail Selling Course in Sioux City," *Vocational Education Survey*, Iowa State Board for Vocational Education, Vol. IX, No. 3 (January, 1932), p. 3.

each of the 15 cooperating merchants. The following five questions were asked:

1. What is your opinion of Millville's cooperative course in retail selling?
2. Would you like to see it continued?
3. Would you like to be considered as a cooperating store for the next school year?
4. Do you think the training was of a practical nature and has helped the student to do a better job?
5. What suggestions can you make?

It was believed that if a real service had been effectively rendered to the merchant, he would be willing to continue participation as a cooperating store. The extent to which he would be willing to continue as such and to expand his cooperation with the school would serve to indicate in some measure the effectiveness of the program. The merchant being indispensable to this form of training, it was felt that his reactions would indicate to what extent the work was functioning to meet his needs.

Of the 15 merchants who cooperated by answering the inquiry all of them replied that there was a definite need for this type of training on the secondary school level. The reason for the need most frequently given was that training received on a cooperative basis was usually more efficient than that offered on any other basis.

Some of the replies to question 1 were:

I can not praise it too highly. Everyone connected with it has worked hard to make it a success. I am convinced that their efforts have been well repaid. It has contributed something to our business that has been a great help, and from what I have observed it has been the same everywhere. It is my sincere hope that this program will be continued. In my opinion it is the making of better young men and women for future careers in business regardless of whether they choose to remain in retailing or not.

A. L. McCloy, Manager
F. W. Woolworth Company

It is one of the most complete selling courses I have ever seen. It is both helpful and practical to merchant and student. Book knowledge plus actual selling experience gives the student confidence in his own ability, without which he can never make a success of himself.

W. S. Kenefic, Manager
Endicott Johnson Shoe Company

Best thing Millville High School has ever done insofar as training the individual along practical lines. Cannot praise the course too highly.

Sam Prince, Proprietor
Prince Apparel Company

I personally think it is one of the best ideas Millville has ever had. It gives the student a chance to go out into business and see what it is all about before he definitely decides what he would like to do. It also gives the merchant the benefit of a salesperson who is trained in the essentials of selling and merchandising.

William Roman, Proprietor
Sadye Specialty Shop

Fine! Both for student and retailer.

D. E. Hayes, Manager
W. T. Grant Company

It brings the student face to face with business problems as they really are. By carrying these problems to the classroom for discussion, he is sure to secure a broader vision and understanding. It is definitely a step in practical education.

George Key, Manager
Bond Grocery Stores, Inc.

All the merchants indicated their willingness to continue as cooperating stores. Several merchants requested consideration to receive a larger number of cooperative trainees for the coming school year. The opinion was unanimous that the training was of a highly practical nature and that it made better, more efficient workers of the trainees.

In all instances, each of the cooperating merchants felt that there was a definite need for this form of training, and that employees who were thus trained were more desirable and efficient workers.

Follow-up study made shortly after graduation revealed that a number of students had advanced to responsible positions and that a large proportion of the students had decided to remain in store work.

Merchants' Ratings of Trainees Both Before and After Training

A questionnaire was submitted to each of the cooperating merchants who were asked to rate the trainees at the conclusion of the training period in the light of their job proficiency both before and after the training.

The returns received from this questionnaire were as follows: 15 merchants replied "Yes" in answer to the question, "Have you found the cooperative student more eager to improve on the job than other employees you have had?" The merchants unanimously replied in the affirmative to the question, "Do you believe that the student's efficiency in job performance was definitely higher than it would have been without the cooperative training?" All the merchants replied "Yes" to the questions, "Have you found cooperative students more interested in their work?" and "Have you noticed steady improvement in the progress of the cooperative student?" All 15 merchants replied "Yes" to the question, "Is it your opinion that the cooperative training has made the student a more desirable employee?"

All the merchants expressed a desire to retain their cooperative part-time trainees for continued full-time employment after graduation.

Each merchant stated that he had from time to time given more responsibility to the student and had noticed a marked improvement in the personality and job efficiency of the student from the time he or she was placed to the present time.

Ten merchants replied that they had promoted the trainee on the job as a direct result of the training received. The merchants unanimously agreed that a cooperative student was more efficient and desirable than one who was not so trained.

Employment Status and Promotions Attained at the Completion of the Training

A follow-up was made by the co-ordinator a few weeks after graduation to determine how successful the cooperative students had been in adjusting themselves to their jobs. The number of students who had been retained for continued employment and the extent and types of promotions attained were noted.

Four girls employed by a local chain store were made division heads after the employer noted "unusual application and fine job attitudes." The employer stated that this was the first time he had ever assigned part-time help to such responsible positions, but believed that the fine job performance of the trainees justified their promotion after their comparatively brief period of employment.

One boy was made division head for a large department store. A grocery chain and a large chain shoe store have appointed their cooperative trainees as assistant managers.

The manager of a leading chain variety store was giving intensive training to the cooperative part-time trainee who had been assigned to his store in preparation to assume the duties of assistant manager in a store in a neighboring community to which the firm was transferring him.

One girl who had particularly impressed her employer, the owner of a high grade specialty shop, was assigned full managerial responsibilities for a new apparel shop which her employer opened as a branch store in a neighboring community.

Another boy went into business for himself, and had opened a furniture and upholstery store. The remainder of the trainees had each received offers to remain in the employ of the stores to which they had been assigned on a full-time basis with increases in salary for all but one.

Summary

An interest in selling and an opportunity to earn money were the impelling motives for taking the training most frequently mentioned by the students.

The students who had taken the training felt that there was a definite need for it and that they were more vocationally efficient and valuable due to their having completed the course.

In listing what they felt were the chief advantages of the training, the students mentioned vocational values most frequently.

A PRAYER

"O Lord God of Hosts, stretch forth, we pray Thee, Thine almighty arm to strengthen and protect our soldiers, sailors and airmen wherever they may be, and all who serve in places of danger; imbue them with loyalty and courage; shield them in the day of battle, and in time of peace keep them safe from evil."

This prayer, culled from the program of the June, 1944, Graduation Exercises of The New York School of Printing was entitled, "A Prayer for 842 Former Students of The New York School of Printing who are now in the Armed Service of Our Country and for others who will serve." — *News Bulletin of the National Graphic Arts Education Association.*

How Can the High School Prepare Students for College Work in Industrial Arts?

*Harold M. Gray**

The Civil War brought the Land Grant Act with its emphasis on agriculture and the mechanic arts in College, and World War I brought the Smith-Hughes Act with emphasis on similar work below the college level. What will be brought out by World War II? The world has certainly seen in the past five years the importance of industrial education in the preparation and carrying on of a venture on a scale such as the world has never before witnessed. It was the trained men in these fields who have aided in reaching our goals for production and training.

Our entrance into the war found us with many hundreds of industrial-arts-instructors, many of whom were well-trained according to the modern philosophy of industrial arts. Needless to say, many of these fine young men are now in the services of our country. To us, who are still on the job, devolves the duty of making lasting plans for doing the most for the greatest number concerned in any field of endeavor.

With our vast need for hundreds of good instructors of industrial arts to replace those who have left us, and to fill new positions all over the country, we must turn our attention to the preparation of young men and women to fill this need.

To help these young people, we should go to the high schools in an effort to find "What can be done in these secondary schools to prepare students for college work in industrial arts?"

There is no particular difficulty in answering this question, however, for it involves many things that not only *can* be done, but that *should* be done.

Perhaps we should see what colleges expect of students first, and base our answer on this. A study of what students, who pursue industrial arts, are expected to take in colleges to obtain a degree in this field are certainly varied. Some colleges have the idea that many skills should be gained, and forsake related information. Many put the emphasis on related information and forsake skills, some attempt to do both, and many do little of anything except give a smattering of this and that under the guise of industrial arts. Obviously the only thing any good college should do is to attempt to give the individual a well-rounded curriculum to follow, which includes necessary skills and related knowledge in many of the various fields of industrial arts, with emphasis to a great degree on the special courses the individuals wish to teach or pursue. Many colleges permit students to receive a teaching certificate after two years of study in the field. This is a grave error. Certainly no student is prepared to teach an industrial-arts course with only two years of study in this field.

It is possible to discuss the question proposed in our title also by considering what is best for one who intends to enter the field of industrial arts in college.

The high school should have a very definite philosophy of industrial education, and hence, industrial arts. This philosophy should recognize as the basic purpose of industrial education the desire to help the individual become personally and socially efficient, adjusted, and developed, by presenting experiences and activities which no other field can do. The purposes for which a student is taking industrial arts should be clearly outlined.

Next to this all-important philosophy, before any high school can do much for students in the field of industrial arts, there must be good instructors who really know their work, both in so far as skills and knowledge are concerned. These instructors must be broad and versatile, and interested in giving the boy a well-rounded view of what "it is all about." They must have the most modern methods of teaching and handling materials at their command.

It is well to emphasize that students who intend to teach industrial-arts subjects should be select students, for they will have to play a most important part in molding the lives of young people. Not only that, but they will be representing one of the most vital forces in the lives of man today, namely, modern industry. Only one with the highest ideals, co-ordination of hands, eyes, and mind, together with more than average scholastic ability can hope to succeed to the greatest degree in the field of industrial arts.

There should be a planned curriculum in high schools for students who intend to enter industrial arts in college. This curriculum should contain, besides, of course, a variety of industrial-arts courses, much English, social science, mathematics, and science. A questionnaire was sent to 20 outstanding men in the field of industrial arts, asking them to list, out of a large group of courses, those which should be offered in high school to students who intend to pursue industrial arts in college. The results were as follows:

Course	*Times course was indicated*
Mechanical Drawing 1	17
Mechanical Drawing 2	16
Machine Drawing 1	11
Machine Drawing 2	7
Architectural Drawing 1	6
Architectural Drawing 2	3
Aviation Drafting 1	2
Aviation Drafting 2	2
Home Planning 1	7
Home Planning 2	3
General Shop	16
Woodwork 1	17
Woodwork 2	13
Aviation Shopwork	3
Pattern Making and Molding	4
General Metal	14
Machine Tool Operation 1	7
Machine Tool Operation 2	5
Auto Mechanics 1	4
Auto Mechanics 2	3
Printing 1	7
Printing 2	5

This indicates that more than one third of the number who answered the questionnaire want the student of industrial arts to take: one year of mechanical drawing, one year of machine drawing, one semester of architectural drawing, one semester of home planning, one semester of general shop, one semester of machine tool operation, and one semester of printing.

In order to offer these courses effectively, there would have to be necessary facilities for doing a good job. These facilities should be modern in every sense of the word. Schools must keep pace with this changing world if there is to be a definite sign of progress, and if the most is to be done for the greatest number concerned.

The years in high school for the prospective college student of industrial arts should be made up of the greatest amount of integration in the field, and the greatest amount of correlation between the mathematics and science.

The industrial-arts courses in high school should place equal emphasis on skills and related knowledge. Skills developed to the point of doing a job right are of utmost importance. Related knowledge to make necessary interpretations and explanations are equally desirable. Nothing short of the combination of these two will be satisfactory. In teaching skills and related knowledge, the instructor has many aids at his command. Heading the list among the many that are applicable to in-

*Sumner High School, St. Louis, Mo.

dustrial-arts subjects are demonstrations, lectures, visual aids, instruction sheets, tests, discussions, reports, projects, problems, published material, models, clubs, excursions, notebooks, mottoes, library, reading, and many others.

In doing the most in high school for this prospective student we cannot overlook the value of such extracurricular activities as industrial-arts societies or craftsmens' clubs, which bring together in wholesome fellowship students of like interests. Neither can we overlook valuable programs such as industrial-arts assemblies, open house programs, and the like, which give the prospective college industrial-arts student a chance to participate.

Briefly, then, the things that can be done in high schools to prepare students for college work in industrial arts may be summarized as follows:

1. The high schools must have a definite and workable philosophy of industrial arts.
2. There must be excellent industrial-arts instructors.
3. The prospective college students should be in special advisory groups with other students whose interests are inclined in the same direction.
4. Students who intend to pursue industrial arts in college should be select students.
5. There should be a planned curriculum of industrial arts for these students.
6. Necessary facilities, which, of course, should be modern, should be available in order to do an effective job.
7. The greatest amount of integration and correlation possible should be aimed at.
8. Equal emphasis should be placed on related knowledge and skills necessary to do a job correctly.
9. As many aids as possible should be used by the instructor in doing a good job of teaching these prospective students.
10. The value of extracurricular activities in further developing these students should not be overlooked.

None of these things can effectively be done by a poorly trained instructor of industrial arts, or by an instructor who has little interest except for the salary he earns, or by the teacher who lacks the initiative to arouse and carry out the interests of his students.

A well-designed curriculum, a functioning program, the interest of the boy, and the well-prepared and good-intentioned instructor must have behind them the administration of the school and the school system. The administration must be an interested party, and must realize that the best educationally sound program must fail if it is not made administratively possible to function.

Selling Vocational Education

*W. McRae Fawcett**

A most remarkable experiment in the selling of vocational education reaches its culmination this June, 1945, with the retirement of the principal of the Vocational School of Chatham, Ontario.

The experiment was remarkable in many senses, not the least of which was the fact that the principal was "the only unqualified secondary school principal in the province" of Ontario, noted Dominion-wide for its strict adherence to a hierarchy of academic qualifications for various grades of teachers and principals.

But Principal Collins was eminently qualified along other lines. He had been a successful businessman after an initial period of primary school teaching. He proceeded, therefore, to sell himself to the local community and to the province and then to sell the offerings of his school.

It is with the latter that this brief outline is concerned for it has had no known equal in Canada and I doubt few, if any, in the United States.

Taking charge in 1920, Harry Collins conceived the idea of putting on an exhibition of the written and project work of his pupils, one night each year. At these exhibitions the best work done during the year was shown; also the students working in the three shops then existing, the wood shop, the auto shop, and the machine shop.

The event became an annual occurrence and the attendance grew from a modest 500 on a single night to a total of over 4000 for three consecutive nights. This was in a city with a population of about 16,000 and surrounded by a rather sparsely populated rural community. The school expanded adding a commercial department and other shops and classrooms. Teachers and principals from other vocational schools visited the exhibition and were amazed. Today many of the ideas have been, and are being, incorporated elsewhere.

According to Harry Collins, the idea of holding an exhibition originated out of his conception of the local Home and School organization as a very inadequate means of conveying to the public the special kind of education obtainable in a vocational school. The best the Home and School had done, he pointed out, was to stimulate some 25 citizens to come to the school to listen to an exposition of the advantages of vocational education given by a member of the school's teaching staff. It was not very satisfactory.

From the first exhibition to the most recent, emphasis has been placed on the usefulness to the pupil in his later communal life of the skills learned in a vocational school. This was accomplished often indirectly as can be gleaned from a résumé of a typical visit on a night of the exhibition.

The typical visitor reaches the rotunda of the school sometime between 7 p.m. and 9 p.m. From then until 11 p.m. he passes where he wills, down corridors bearing huge signs giving directions to the various exhibits, into classrooms whose walls are lined with illustrative work done by various pupils and signed by them, into the typewriting department, the drafting room, the machine shop, the auto shop, the wood shop, and the electric shop in all of which select groups of budding specialists operate under the supervision of teachers. Not only are useful projects seen mounted over the names of their youthful creators but the latter are seen actually at work operating the many and complex machines peculiar to each shop.

Sometimes the visitor is assisted to his impressions. He may, upon arrival, be greeted by the principal and supplied with an undergraduate guide from the commercial department. He may receive a complimentary item from the shops, a blueprinted map of the city from the drafting room, a center punch from the machine shop, a small whatnot from the wood shop. His interest never flags. He is led to investigate and to learn that pupils in a vocational school know more than just theory. They can use their hands, operate machines, and turn out respectable finished products.

In this connection, the reaction of a local building contractor is interesting. It was on a visit to the wood shop during an exhibition, watching boys frame a small model of a house, that he lost enough prejudice against the graduates of the school in building construction to hire one experimentally. He liked the boy. He hired others. Then a few years ago, he was quoted by the *Windsor Daily Star* as saying of one of the boys hired that he preferred him to "the average apprentice with ten years' experience." The *Star* had a picture of the boy at work. That, for Harry Collins, was a chicken coming home to roost. He clipped the writeup and the picture and gave it wide publicity just as he has done with many other similar writeups and pictures.

What about operational costs at these exhibitions? As long as I have been a member of the staff, which is since 1932, the pupils and the teachers have supplied their time gratis. The pupils in particular have been most eager to take part in the various activities. They have come to look upon the event as a kind of three-day

*Chatham Vocational School, Chatham, Ont., Can.

adventure toward the close of the school term and they have never been encouraged to think otherwise. Such devices as shortening the school day by an hour or so for the three days involved have helped considerably.

On the revenue side of the ledger, there are placed the amounts of the admissions and the amounts realized from the sale of the school magazine. The latter has always been considered as a project in journalism. Often it has been pointed out in an editorial foreword by the principal that the production of such a magazine assists not only journalistic expression and development of talent but affords opportunity for practical work along certain lines of office practice. The price of the school magazine has been successively five, ten, and fifteen cents, and the price of admission ten and fifteen cents. The admission to the exhibition has always included admission to a stage presentation of choral and gymnastic character in the school auditorium.

The net profit which often has run as high as $400 per year has been used chiefly to build up a cultural and artistic environment in the school. Over $1,000 worth of books have been added to the school library. Works of art have been hung in the classrooms and the school corridors. Many patriotic and charitable organizations have been supported.

But the biggest net profit has come from the conversion of the people of the community from their disposition to look down upon any kind of education savoring of the manual. This was a very prevalent disposition about 1920, according to Principal Collins. He likes to quote incidents showing how the people have swung over from their old belief. One of the most satisfactory to him was the spectacle, during the depression of the early thirties, of city after city closing evening shop classes while the mayor and city council of Chatham, a conservative council at that, were expressing the fond hope that such classes in Chatham would continue. They continued.

Teaching Materials For Industrial Education

*Chris H. Groneman**

(Continued from page 165 of the April, 1945, issue)

Films

The following list of teaching aids was collated to help the teachers of the various departments of industrial arts and vocational education.

It is advisable that teachers use school stationery when writing for any of the films listed. Films should be ordered well in advance — several weeks' notice would be desirable. In ordering films it is best to mention a second and third choice in case the first selection cannot be furnished at once. The size of the film should be specified, and the desired date must be given; also an alternate date, if possible.

Prompt return of films is essential to assure available prints for the next exhibitor. A 16mm. sound print must be projected only on 16mm. sound projectors. Projection on a silent machine will ruin the film for all future use.

All films are free unless otherwise noted. Transportation charges must be met in every case. The borrower is required to pay for any loss or damage done to the films in his possession. Where a loan fee is requested, that fee should be included with the order to save time and correspondence concerning this.

Electrical and Communications

General Electric Co., 1 River Road, Schenectady 5, N. Y.
Distribution points for General Electric Films:
920 Southwest Sixth Ave., Portland, Ore.;
Department of Visual Instruction,[1] University of California, Berkeley, Calif.;
235 Montgomery St., San Francisco, Calif.;
200 S. Main St., Salt Lake City, Utah;
212 N. Vignes St., Los Angeles, Calif.;
650 Seventeenth St., Denver, Colo.;
1801 N. Lamar St., Dallas, Tex.;
840 S. Canal St., Chicago, Ill.;
187 Spring St., N.W., Atlanta, Ga.;
4966 Woodland Ave., Cleveland, Ohio;
140 Federal St., Boston, Mass.;
570 Lexington Ave., New York, N. Y.;
1405 Locust St., Philadelphia, Pa.

Sightseeing at Home—Film No. S-2487—15 min.—16 and 35mm.—Sound
"2311"—Film No. S-2496—11 min.—16 and 35mm.—Sound
The Story of FM—Film No. S-2489—17 min.—16mm.—Sound
Railroadin'—Film No. S-2466—28 min.—16mm.—Sound
Exploring With X-Rays—Film No. S-2464—40 min.—16 and 35mm.—Sound
Curves of Color—Film No. S-2451—10 min.—16mm.—Sound
The World's Largest Electrical Workshop—Film No. S-2428—32 min.—16 and 35mm.—Sound
Training Films of Arc—6 parts—each complete—10 min. each—16mm.—Sound
The Inside of Atomic-Hydrogen Arc Welding—2 parts—each complete—10 min. each—16mm.—Sound
Excursions in Science—No. 6—Film No. S-2346—10 min.—16 and 35mm.—Sound
Excursions in Science—No. 5—Film No. S-2345—9 min.—16 and 35mm.—Sound
Excursions in Science—No. 1—Film No. S-02341—9 min.—16 and 35mm.—Sound
Excursions in Science—No. 2—Film No. S-2342—10 min.—16 and 35mm.—Sound
Excursions in Science—No. 3—Film No. S-2343—11 min.—16 and 35mm.—Sound
Excursions in Science—No. 4—Film No. S-2344—9 min.—16 and 35mm.—Sound
Beating Time—Film No. S-2471—11 min.—16 and 35mm.—Sound
Life of Thomas A. Edison—Film No. S-2259—11 min.—16 and 35mm.—Sound
Magic Versus Science—Film No. S-2267—12 min.—16 and 35mm.—Sound
Bill Howard, R.F.D.—Film No. S-2395—52 min.—16 and 35mm.—Sound
A Modern Zeus—Film No. S-2288—10 min.—16 and 35mm.—Sound
Vanishing Vitamins—Film No. S-2480—17 min.—16mm.—Sound
Don't Blame It on the Oven—Film No. S-2515—19 min.—16mm.—Sound
Into the Wringer and Out—Film No. S-2514—15 min.—16mm.—Sound
As Always—Film No. S-2479—15 min.—16mm.—Sound
From Now On—Film No. S-2423—42 min.—16 and 35mm.—Sound
It's Your Move—Film No. S-2437—41 min.—16mm.—Sound
Like Hotcakes—Film No. S-2424—18 min.—16mm.—Sound
Beauty and Quality—Film No. S-2463—28 min.—16mm.—Sound
The Proof of the Pudding—Film No. S-2465—14 min.—16mm.—Sound
West Lynn—Film No. S-2460—31 min.—16mm.—Sound
When You Can Measure—Film No. S-2371—36 min.—16 and 35mm.—Sound
There's a Difference—Film No. S-2403—40 min.—16 and 35mm.—Sound
Steam Turbines—Film No. S-2403—13 min.—16 and 35mm.—Sound
Oil-Filled Cable—Film No. S-2368—41 min.—16 and 35mm.—Sound
A Woolen Yarn—Film No. 32—15 min.—16 and 35mm.—Silent

*Industrial Education Department, A. & M. College of Texas, College Station, Tex.
[1] A small service charge is made for films ordered from this point.

A World of Paper—Film No. 42—29 min.—16 and 35mm.—Silent
Thomas A. Edison—Film No. 41—16 min.—16 and 35mm.—Silent
The Panama Canal—Film No. 49—15 min.—16 and 35mm.—Silent
Pillars of Salt—Film No. 45—17 min.—16 and 35mm.—Silent
Mountains of Copper—Film No. 60—16 min.—16 and 35mm.—Silent
Conquest of the Cascades—Film No. 57—16 min.—16 and 35mm.—Silent
The Sugar Trail—Film No. 29—15 min.—16 and 35mm.—Silent
The Benefactor—Film No. 20—27 min.—16 and 35mm.—Silent

Radio Corporation of America, RCA Victor Division, Camden, N. J.
(Contact William J. Ganz Company, 40 E. 49th St., New York City)
Television (The Birth of an Industry)—10 min.—16mm.—Sound
Airwaves (Radio Broadcasting)—10 min.—16mm.—Sound
Unseen Worlds (The Story of the Electron Microscope)—10 min.—16mm.—Sound
Electrons on Parade (Radio Receiving Tubes at Work)—20 min.—16mm.—Sound
Radio at War (Communications)—24 min.—16mm.—Sound

Tennessee Valley Authority, Knoxville, Tenn.
TVA—20 min.—16 and 35mm.—Sound
Wasted Waters—19 min.—16 and 35mm.—Silent
Motion Study Applied to Letter Indexing—11 min.—16 and 35mm.—Sound
Wilson Dam School—20 min.—16mm.—Sound
Norris Dam Construction—20 min.—16 and 35mm.—Silent
Electricity on the Farm—22 min.—16 and 35mm.—Silent
Shell Mounds in the Tennessee Valley—21 min.—16 and 35mm.—Silent
Scenic Resources of the Tennessee Valley—10 min.—16 and 35mm.—Silent
Building Land and People—16mm.—2 reels—Silent
The River—30 min.—16mm.—Sound
Malaria Control in the Tennessee Valley—40 min.—16mm.—Sound
Fishing on the Great Lakes of the South—20 min.—16mm.—Silent
10,000 Fires—20 min.—16mm.—Sound

Westinghouse Electric and Manufacturing Co., 306 Fourth Ave., P.O. Box 1017, Pittsburgh 30, Pa.
On the Air—No. 114—28 min.—16 and 35mm.—Sound
The Ramparts We Build—No. 101—20 min.—16 and 35mm.—Sound
Electronics at Work—No. 102—20 min.—16 and 35mm.—Sound
What Is Electricity?—22 min.—16 and 35mm.—Sound
This, Too, Is Sabotage—No. 104—26 min.—16 and 35mm.—Sound
V Men—No. 105—17 min.—16 and 35mm.—Sound
40 Billion Enemies—No. 106—25 min.—16mm.—Sound
The Precious Ingredient—No. 107—25 min.—16 and 35mm.—Sound
Prospects Set the Pace—No. 108—12 min.—16 and 35mm.—Sound
You Can Have Everything—No. 109—27 min.—16 and 35mm.—Sound
Unsung Heroes—No. 110—31 min.—16mm.—Sound
There's Nothing to It—No. 111—20 min.—16 and 35mm.—Sound
How to Make Electrical Farm Equipment Last for the Duration—Slide Film No. 306—15 min.—Sound
Proper Care Means Longer Wear—Slide Film No. 307—15 min.—Sound

Willard Storage Battery Co., 246 E. 131st St., Cleveland, Ohio.
Willard and You—30 min.—Sound
The Story of the Storage Battery[3]—Silent
The Test[3]—Silent

Industrial and General

Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wis.
We Work for Victory and We Plan for Peace—16mm.—Sound
The Magic of Steam—16mm.—Sound
The Surface Condenser—16mm.—Sound
Women Power—16mm.—Sound

American Viscose Corp., 350 Fifth Ave., New York, N. Y.
Rayon—A New Frontier of Progress—37 min.—16mm.—Sound

Anthracite Institute, 101 Park Ave., New York, N. Y.
Origin, Mining, and Preparation of Pennsylvania Anthracite—20 min.—16mm.—Silent

Bakelite Corp., 30 E. 42nd St., New York, N. Y.
Origin, Manufacture, and Application of Bakelite—20 min.—16mm.—Sound and Silent

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.
Eyes of Science—45 min.—16 and 35mm.—Silent
To Greater Vision—30 min.—16mm.—Sound
Let's Make a Pair of Eyeglasses—Lantern Slide Lecture
Look Inside Your Eyes—Lantern Slide Lecture

Bell and Howell Co., 1801 Larchmont Ave., Chicago, Ill.
Educational Utilization Digest—16mm.—Sound
Catalog of Educational Motion Pictures—16mm.—Sound

Brandon Films, Inc., 1600 Broadway, New York, N. Y.
(The following films are one reel each. Silent versions, 15 min., $1.50 to loan; sound versions, 10 min., $2 to loan.)
Elementary Manual Training
Elementary Bookbinding
Marionettes
Loom Weaving
Decorative Metal Work
Leather Work
Toys From Odds and Ends
Simple Block Printing
Clay Pottery

J. I. Case Co., Racine, Wis.
That the Millions May Eat—10 min.—16mm.—Sound
Food and Freedom—10 min.—16mm.—Sound
Soil and Life—10 min.—16mm.—Sound
Broad Base Terracing—10 min.—16mm.—Sound
Build Good Terraces With Your Own Moldboard Plow—10 min.—16mm.—Sound
The Case System of Making Hay—10 min.—16mm.—Sound
Orchard Power—10 min.—16mm.—Sound
On Your Neighbor's Farm—10 min.—16mm.—Sound
What's Behind the V Series Tractors—10 min.—16mm.—Sound

Castle Films, Inc., Field Bldg., 135 S. LaSalle St., Chicago, Ill.
She Saves Who Sews—18 min.—16mm.—Sound
Meat and Romance—40 min.—16mm.—Sound
Yesterday, Today, and Tomorrow—30 min.—16mm.—Sound
The Alaska Highway (sponsor prefers adult showings)—11 min.—16mm.—Sound
Secret Weapon—20 min.—16mm.—Sound
From Bristles to Brushes—30 min.—16mm.—Sound
You Can, Too—35 min.—16mm.—Sound
The Making of American Homes—20 min.—16mm.—Sound
Ever Since Eden—35 min.—16mm.—Sound
Citrus in Nutrition—20 min.—16mm.—Sound
Trees for Tomorrow—18 min.—16mm.—Sound

Department of Conservation, 121 State House, Springfield, Ill.
As Ye Sow—30 min.—16mm.—Sound
The Heritage We Guard—45 min.—16mm.—Sound
Forests, Nurseries, Game—25 min.—16mm.—Sound
Making of a Shooter—20 min.—16mm.—color—Sound
Once Upon a Time—15 min.—color—Silent
Paper Making—25 min.—Sound
Caught by the Camera—20 min.—Kodachrome—Silent
Quail Raising—20 min.—Sound
Pheasant Raising—40 min.—Silent
Prairie Chicken—Silent
Food Patch Planting—Silent
Game Management—Silent
Geese at Horseshoe Lake—Silent

Dow Chemical Co., Midland, Mich.
The Working of Magnesium—16mm.—Sound
Magnesium from the Sea—16mm.—Sound

E. I. Du Pont de Nemours & Co., Tenth and Market Sts., Wilmington 98, Dela.
Mr. Smith Is Proud—20 min.—16mm.—Sound
Fashion's Favorite—33 min.—16 and 35mm.—Sound
Facts About Fabrics—26 min.—16 and 35mm.—Sound
The Wonder World of Chemistry—22 min.—16 and 35mm.—Sound
A New World Through Chemistry—20 min.—16 and 35mm.—Sound—Color
Three-Dimensional Seeing—15 min.—16mm.—Sound—Color
Salvaging Waste Light for Victory—17 min.—16mm.—Sound—Color
Guardians of Plenty—26 min.—16mm.—Sound—Color
A Better Way—18 min.—16mm.—Sound—Color
Soldiers of the Soil—40 min.—16 and 35mm.—Sound

DuPont Semesan Co., 101 W. Tenth St., Wilmington 98, Dela.
Black Scourge—12 min.—16 and 35mm.—Sound
Grain Thieves—12 min.—16 and 35mm.—Sound
Seeds of Prosperity—12 min.—16 and 35mm.—Sound
King Cotton—12 min.—16 and 35mm.—Sound
Peruvian Gold—12 min.—16 and 35mm.—Sound
Tall Corn—12 min.—16 and 35mm.—Sound
Feeding the Multitude—12 min.—16 and 35mm.—Sound
Enemies of Fine Grasses—12 min.—16 and 35mm.—Sound

Eastman Kodak Co., Camera Club Service, Rochester 4, N. Y.
The Cavalcade of Color (Kodachrome)—15 min.—16mm.—Sound

Eberhard Faber Pencil Co., 37 Greenpoint Ave., Brooklyn 22, N. Y.
Two Cents Worth of Difference—3 reels—16mm.—Sound

The Educational Screen, 64 East Lake St., Chicago, Ill.
1,000 and One—The Blue Book of Non-Theatrical Films (A directory of non-theatrical films from various sources)—75 cents

[3] Available through Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.

Indiana University, Extension Division, Bloomington, Ind.
26 sets of lantern slides on health and welfare
(Outside the state—$1 per day, plus transportation both ways; or $5 per year, 75 cents per set)
31 silent 16mm. films (Rental: 75 cents a reel a day)
120 sound films in the field of health—16mm. (Rental: $1.25)
Catalog and supplement free.

International Harvester Co., 180 North Michigan Ave., Chicago, Ill.
The Strong Shall Be Free—2 reels—16 and 35mm.
The Marines Have Landed—1 reel—16 and 35mm.
Save Those Tools—1 reel—16 and 35mm.
Golden Harvest—1 reel—16 and 35mm.
Yesterday and Today—1 reel—16 and 35mm.
Keep It Moving—1 reel—16 and 35mm.
Power That Covers the Field—1 reel—16 and 35mm.
For a Permanent Agriculture—1 reel—16 and 35mm.
The Right Material in the Right Place—2 reels—16 and 35mm.
Jungle Yachts in the Belgian Congo—2 reels—16 and 35mm.
Helpful Henry—2 reels—16 and 35mm.
The Building of Boulder Dam—1 reel—16 and 35mm.
Modern Education in the Beaverton Consolidated School—1 reel—16 and 35mm.
The Wilsons Go to Town—1 reel—16 and 35mm.
Two Seconds from Cutting to Threshing—1 reel—16 and 35mm.
Caravan of Progress—1 reel—16 and 35mm.
Our Daily Bread—1 reel—16 and 35mm.
Acres of Rice—1 reel—16 and 35mm.
Romance of the Reaper—3 reels
The Story of Binder Twine—1 reel—16 and 35mm.
Farm Inconveniences—1 reel—16 and 35mm.
My Model Farm—1 reel—16 and 35mm.
Soybeans for Farm and Industry—1 reel—16 and 35mm.
International Logging—1 reel—16 and 35mm.
From Trees to Lumber—1 reel—16 and 35mm.
Power for the Oil Industry—1 reel—16 and 35mm.
Party Line—2 reels—16 and 35mm.
Cold Facts From the Northland—1 reel
Profitable Power—1 reel—16 and 35mm.
Beating Old Man Weather—1 reel
Snow Fighters—1 reel
New Oil Field Methods—1 reel—16 and 35mm.
Power in the Potato Field—1 reel
The Strength Unseen—16 and 35mm.
Fresh from the Garden—1 reel—16mm. only Kodachrome

Iowa, University of, Extension Division, Iowa City, Iowa
Catalog of Visual Aids for Classroom Use—Bulletin 537 (Contains prices of following films)
12 Subjects on Health—16mm.—Silent—Charge
48 Subjects in Biological Sciences and Health—Sound—Charge
Others in child welfare, geography, industrial engineering, nature study, safety, physical science, social science, and music—Sound—Charge

The Jam Handy Organization, 2900 E. Grand Blvd., Detroit 11, Mich.
Passing the Know-How Along—1½ reel—Silent—Charge
"Slidefilms and Motion Pictures to Help Instructors"—Catalog of Jam Handy 16mm. Sound Motion Pictures and Jam Handy Discussional Slidefilm Kit-Sets with prices

Kansas, University of, Bureau of Visual Instruction, Extension Division, Lawrence, Kans.
Body Defenses Against Disease
Body Defenses Against Disease—10 min.—Sound—$1.50
How Our Health Is Protected—45 min.—Sound—$3.00
Man Against Microbe—16 min.—Silent—25 cents
Preventing Spread of Disease—10 min.—Sound—$1.50
Why Willie Was Willing to Wash—10 min.—Sound—$1.50
Defense Against Invasion—10 min.—Sound—$1.50
Digestion of Food
Digestion—16 min.—Silent—60 cents
Digestion of Foods—10 min.—Sound—$1.50
Foods and Nutrition—10 min.—Sound—$1.50
Exercise
Road to Health and Happiness—16 min.—Silent—60 cents
Food Products
ABC of Food—16 min.—Silent—60 cents
Acres of Rice—10 min.—Sound—50 cents
Bananas—10 min.—Sound—50 cents
Canada's Maple Industry—16 min.—Silent—25 cents
Corn Farmers—10 min.—Sound—$1.50
Fruits, Vegetables, and Cooperation—45 min.—Sound—$1.00
Milk from Farm to Table—10 min.—Sound—$1.50
Orange Growers—10 min.—Sound—$1.50
Quality Milk—16 min.—Silent—60 cents
Story of Wheat—10 min.—Sound—50 cents
Heart and Circulation
Heart and Circulation—10 min.—Sound—$1.50
Mechanisms of Breathing—10 min.—Sound—$1.50
Heredity
Heredity—10 min.—Sound—$1.50
Hygiene
About Faces—10 min.—Sound—50 cents
Care of the Feet—16 min.—Silent—25 cents
Clean Clothes—8 min.—Silent—60 cents
Clean Face and Hands—8 min.—Silent—60 cents
Cleanliness: Bathing—8 min.—Silent—60 cents
Cleanliness: Keeping Hair Clean—8 min.—Silent—60 cents
If It's Health You're Seeking—30 min.—Silent—$1.20
Life of a Healthy Child—16 min.—Silent—60 cents
Mysteries of Water—10 min.—Sound—$1.50
Public Health—10 min.—Sound—$1.50
Purifying Water—16 min.—Silent—60 cents
Sewage Disposal—16 min.—Silent—60 cents
What Price Health—16 min.—Silent—60 cents
Water—Every Drop a Safe One—10 min.—Sound—$1.50
Life History of the Mosquito and Fly
Housefly—16 min.—Silent—60 cents
Mosquito—45 min.—Silent—25 cents
Mosquito—Singing and Stinging—16 min.—Silent—60 cents
Life Saving
Life Saving and Resuscitation—16 min.—Silent—60 cents
Meat Packing
Dehydration—22 min.—Silent—50 cents
Home Demonstration Work—22 min.—Sound—$1.50
Meat for America—22 min.—Sound—50 cents
Meat Packing—16 min.—Silent—60 cents
Microscopic View of Blood Circulation
Circulation—16 min.—Silent—60 cents
Circulatory Control—16 min.—Silent—60 cents
Nervous System
Nervous System—10 min.—Sound—$1.50
Physiology
Body Framework—16 min.—Silent—60 cents
Control of Body Temperature—10 min.—Sound—$1.50
Endocrine Glands—10 min.—Sound—$1.50
Eye—How We See—16 min.—Silent—60 cents
How Teeth Grow—16 min.—Silent—25 cents
Muscles—16 min.—Silent—60 cents
Skin—16 min.—Silent—60 cents
Teeth—Our Teeth—10 min.—Sound—$1.50
Posture
Educated Feet—16 min.—Silent—60 cents
Posture—16 min.—Silent—60 cents
Reproduction
Cell Division—16 min.—Silent—60 cents
In the Beginning—22 min.—Sound—$1.50
Swimming
Learn to Swim—22 min.—Sound—$1.50
Swimming and Diving Aces—10 min.—Sound—$1.00
(The following glass slides are also available)
Anatomy and Physiology
Bones and Teeth—9 min.—25 cents
Brain and Nervous System—9 min.—25 cents
Circulatory System—13 min.—25 cents
Digestive System—7 min.—25 cents
Muscles—11 min.—25 cents
Sense Organs—12 min.—25 cents
Health—20 min.—25 cents
Policing the Mouth—39 min.—25 cents
Safety First—15 min.—25 cents
Tale of Soap and Water—42 min.—25 cents
Dairying
Cow Makes Farming Profitable—60 min.—25 cents
Livestock on Every Farm—59 min.—25 cents
Flies
Trap the Fly—44 min.—25 cents
Food Products
Corn Is King—60 min.—25 cents
Farm Poultry Pays—53 min.—25 cents
Oats Crop—44 min.—25 cents
Hawaiian Food Products—26 min.—25 cents
Home Canning
Home Canning by the Cold Pack Method—60 min.—25 cents

Keystone View Co., Meadville, Pa.
Slides on general subject matter of hygiene and health; posture;

(Continued on page 204)

Industrial Arts and Vocational Education

John J. Metz, Editor

ARE WAR-PRODUCTION EFFORTS STILL NECESSARY?

The advances made by the allied armies in both theaters of war may give many people the idea that there is no longer need for trying to augment the output of our war-production factories. Teachers may feel the same way and plan to spend their vacation this year at some lake or mountain resort as they were accustomed to do years ago.

There is still need, however, to bear in mind that huge quantities of war materials will be used up before our European and Japanese enemies will have been subdued. It is unsafe then in planning for a vacation of leisure when man power is still so much in demand. The teachers themselves can help much in the production field during the summer months, but they also can help their students so that their efforts will help to furnish our fighting men with all of the things needed to carry on and bring to a victorious end this frightful war that has been forced upon us.

Naturally it would be much more pleasant for both teachers and students to enjoy the old-time vacation but these times require extraordinary efforts from everybody, and the schools must do their part to set the right example for the rest of the community.

Shop teachers, then, if at all possible should do their share personally to take an active part in the war-production work performed in their own community. The older students, too, should be assisted in securing employment either in factories or on the farms. It is only in this way that the home front can do its full part in backing up those who have to give up everything so that we may enjoy the blessings of American freedom.

POST SCHOOL-YEAR PLANNING

Juvenile delinquency has received much publicity in the newspapers for the past two years, and as usual, while much has been said, little has been done about it. These columns have suggested at various times what might be undertaken by the school, especially the school shop, to help provide the necessary supervision for our young boys and girls so that they would not fall foul of the law.

Some of these suggestions are repeated because conditions the country over do not seem to have improved. It is doubly necessary to think of ways and means to curb juvenile delinquency as vacation time is approaching, because children will then spend many more hours without supervision, unless some definite plans are made right now. Postwar planning, no doubt, is important, but planning for preserving the lives, characters, and morals of our youngsters is ever important and necessary.

What then can be done to help in the solution of this serious problem?

Naturally, almost anything that might be suggested will require the outlay of some money. That ought not to cause too much lamentation because the apprehension, court trials, housing, and care of our juvenile delinquents also cost money, and really enormous quantities of money at that.

Supervised playgrounds are one good method of taking care of larger groups during the summer months. School shops as work centers for boys and girls who are interested also have proved beneficial. Activities based on the boy scout and girl scout programs such as hiking, nature study, and picnics, will always attract a good number of youngsters.

Then, too, a central work bureau might be established to give eligible boys and girls an opportunity to do worthwhile community work, such as cleaning up unsightly spots along the banks of rivers, ponds, or lakes, landscape park and school grounds, take care of smaller children, cut and sprinkle lawns, weed gardens, and work of this kind.

A work bureau such as this serves a double purpose. It helps to stabilize the prices paid for these various services to children, and it also helps to set up standards for the work done.

The more widespread these vacation offerings are, the better, because there must be real interest aroused; otherwise the boys and girls will not attend. It is well to remember also that the strict school discipline must be dispensed with.

For this reason it is well to make the various groups rather self-governing. Since good results are obtained by the self-government plan in many schools, it may be found just as workable in a supervised vacation plan.

In many of the larger cities, variations of the foregoing suggestions are annually offered. But even in these communities, the benefits of these offerings ought to be made much more generally available because the attendance covers but a very small percentage of the school population.

Planning for this type of summer work must be begun at once if it has not been started already. It will be real work, and there will be many hard nuts to crack. The results may not appear to be very tangible at first, but the benefits will become more and more apparent as the work takes form and its acceptance in the community becomes more general.

A SCHOOL FIRE BRIGADE

A release received from the Safety Research Institute, Inc., 420 Lexington Avenue, New York City, on the subject of fire protection for industrial plants, businesses, and institutions, contains the statement that where well-organized plant fire brigades exist, 60 to 98 per cent of the fires are disposed of with trivial losses.

Probably the idea of the plant fire brigade can also be applied in the school. While this may seem of little importance in the schools of large cities, the idea may be of great importance in the smaller communities and in country schools.

An incipient fire may be put under control quickly if attacked at once and in the right way. To do it in the proper manner requires trained and coordinated efforts. Such training may be given in school to the older students and the benefits from this training would be far reaching, because it would go beyond the classroom into the home and into the occupational fields, and might help reduce the gigantic financial loss which our country suffers yearly due to the ravages of fire.

The responsibility for organizing, training, equipping, and directing, might well be assumed by the shop teacher. The training Manual for Industrial Fire Brigades, published by the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass., may be used by the teacher to gain some practical knowledge of what a fire fighter needs to know.

Under his guidance and with periodic fire-fighting drills, the school fire brigade will be a real civic undertaking and a first-class medium for making students safety and civic minded.

Work should be one of the most honored words in our American language—on a par with mother, home, and freedom. Work offers the greatest opportunity for self-expression and self-expression is perhaps the greatest thing life has to offer.—*R. H. Woods.*

(Continued from page 202)

skeletal and muscular system; digestive system; circulation and respiration; special senses; teeth; safety on the highway; safety in the home; safety in recreation; general science; and physics. (Above films available by purchase or rental.)

Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y.
- Proof of the Pudding—16 and 35mm.—Sound
- A New Day—16 and 35mm.—Sound
- Man Against Microbe—16 and 35mm.—Sound and Silent
- Once Upon a Time—35mm.—Sound—(black and white, or color)—16mm.—Sound
- (The following film strips are also available)
- Madame Curie and the Story of Radium—Silent
- Edward Jenner and the Story of Smallpox Vaccination—Silent
- Robert Koch—Silent
- Florence Nightingale—Silent
- Louis Pasteur—Silent
- Walter Reed—Silent
- Edward Livingston Trudeau—Silent

Minnesota, University of, Minneapolis, Minn.
- Films on health, science, and agriculture—16mm.—Sound—Charge

Mohawk Carpet Mills, Inc., Amsterdam, N. Y.
- These Changing Times—16mm.—Sound
- Setting the Pace—16mm.—Sound

National Child Labor Committee, 419 Fourth Ave., New York 16, N. Y.
- Shall Children Work in Wartime (60 slides)—$2 loan plus postage

National Dairy Council, 111 North Canal St., Chicago 6, Ill.
- Free catalog of health education material
- Free leaflet, "Say It With Movies," describing health and nutrition education movies

National Industrial Information Committee, 14 W. 49th St., New York 20, N. Y.
- Postmark—U.S.A.—10 min.—16 and 35mm.
- American Anniversary—15 min.—16 and 35mm.—Sound
- America Marching On—10 min.—16 and 35mm.—Sound—16mm.—Silent
- Frontiers of the Future—10 min.—16 and 35mm.—Sound

National Tuberculosis Association, 1790 Broadway, New York 19, N. Y.
- (The following films are available through state and local tuberculosis associations, or write to above)
- The Role of the Public Health Nurse in the Home Care of Tuberculosis—20 min.—16 and 35mm.—Sound
- Middletown Goes to War—20 min.—16 and 35mm.—Sound
- Sand in the Gears—18 min.—16 and 35mm.—Sound
- Another to Conquer—20 min.—16 and 35mm.—Sound
- Goodbye, Mr. Germ—14 min.—16 and 35mm.—Sound
- They Do Come Back—17 min.—16 and 35mm.—Sound
- Cloud in the Sky—18 min.—16 and 35mm.—Sound
- On the Firing Line—20 min.—16 and 35mm.—Sound
- Let My People Live—15 min.—16 and 35mm.—Sound
- Behind the Shadows—15 min.—16 and 35mm.—Sound and Silent

New York State Department of Health, 152 Washington Ave., Albany 6, N. Y.
- Note: All films produced by the New York State Department of Health are loaned free in New York State. They are for sale at minimum prices by the Department's sales representative—Thomas J. Valentino, Inc., 1600 Broadway, New York City.
- Babies, Baths and Bubbles (Baby Bathing)—10 min.—Silent
- Clocking a Champion (Baby Care)—10 min.—Sound—Color
- Fighters in White (Emergency Medical Service)—13 min.—Sound
- Four Point Safety Home (Home Safety)—16 min.—Sound
- Home Nursing in Pneumonia—10 min.—Sound
- Local Health Problems in War Industry Areas—14 min.—Sound
- On Guard! (Diphtheria Immunization)—5 min.—Sound
- Quit Worrying! (Emergency Maternity and Infancy Care)—5 min.—Sound
- Smallpox and Vaccination (For professional audiences only)—30 min.—Sound—Color
- Story of My Life by Tee Bee (Tuberculosis)—5 min.—Sound
- 'Twixt the Cup and the Lip—(short) 13 min.—Sound—(Restaurant Sanitation)—(long) 21 min.—Sound
- What of Your Child? (Child Care Centers)—5 min.—Sound
- Your Public Health Nurse—10 min.—Sound

New York University Film Library, 71 Washington Square South, New York 12, N. Y.
- Battle for Oil—20 min.—Sound—$2.50
- Eating at Work—10 min.—Sound—$1.50
- Food—Weapon of Conquest—20 min.—Sound—$3.00
- Harvest Shall Come—40 min.—Sound—$4.50
- Resurrection—20 min.—Sound—75 cents[a]
- Transfer of Skill—10 min.—Sound—$1.50
- Via Persia—10 min.—Sound—$1.50
- The World at War—40 min.—Sound—$2.50
- The World of Plenty—50 min.—Sound—$5.00
- Building a Bomber—20 min.—Sound—50 cents[a]
- Building a Tank—20 min.—Sound—50 cents[a]
- Construction of a Light Airplane—30 min.—Sound—50 cents[a]
- ABCD of Health—10 min.—Sound—$1.50
- Arm Behind the Army—10 min.—Sound—50 cents[a]
- Black Marketing—10 min.—Sound—50 cents[a]
- A Gift for the General—30 min.—Sound—75 cents[a]
- Campus Frontiers—30 min.—Sound—75 cents[a]
- A Happy Childhood—10 min.—Sound—$2.00
- Schools to the South—20 min.—Sound—50 cents[a]
- Good Neighbor Family—20 min.—Sound—50 cents[a]
- Grain That Built a Hemisphere—10 min.—Sound—50 cents[a]
- High Over the Border—20 min.—Sound—50 cents[a]
- South of the Border With Walt Disney—30 min.—Sound—50 cents[a]
- New Towns for Old—10 min.—Sound—$1.50
- New Earth—20 min.—Sound—$3.00
- Night Mail—30 min.—Sound—$3.50
- Should We Discuss the Next Peace Now?—30 min.—Sound—12" at 78 r.p.m.—$4.75—16" at 33-1/3 r.p.m.—$3.75
- Political Reconstruction—30 min.—Sound—12" at 78 r.p.m.—$4.75—16" at 33-1/3 r.p.m.—$3.75
- Economic Requisites of a Durable Peace—30 min.—Sound—12" at 78 r.p.m.—$4.75—16" at 33-1/3 r.p.m.—$3.75
- The Challenge of the Four Freedoms—30 min.—Sound—12" at 78 r.p.m.—$4.75—16" at 33-1/3 r.p.m.—$3.75
- The Sound of History: Then Came War—1939—30 min.—Sound—12" at 78 r.p.m.—$6.50
- The Undefended Border—25 min.—Sound—12" at 78 r.p.m.—$4.50—16" at 33-1/3 r.p.m.—$3.50
- As a Man Thinketh—25 min.—Sound—12" at 78 r.p.m.—$4.50—16" at 33-1/3 r.p.m.—$3.50
- Roger Williams—25 min.—Sound—12" at 78 r.p.m.—$4.50—16" at 33-1/3 r.p.m.—$3.50
- Susan B. Anthony—25 min.—Sound—12" at 78 r.p.m.—$4.50—16" at 33-1/3 r.p.m.—$3.50
- Thomas Paine—25 min.—Sound—12" at 78 r.p.m.—$4.50—16" at 33-1/3 r.p.m.—$3.50
- John Brown—25 min.—Sound—12" at 78 r.p.m.—$4.50—16" at 33-1/3 r.p.m.—$3.50
- Credit Unions—The People's Banks—15 min.—Sound—12" at 78 r.p.m.—$3.75—16" at 33-1/3 r.p.m.—$3.75
- Youth Speaks for Itself (6 recordings—$1.50 each)—90 min.—Sound—$5.00 per set

Office of War Information, Bureau of Motion Pictures, Washington 25, D. C.
- Catalog of Educational Films entitled "War Films for War Use," covering the following subjects:
- Our Fighting Forces
- The People of Our Allies
- The Nature of Our Enemies
- News Reviews
- The Production Front
- The Farm Front
- The Home Front
- Song Shorts
- (Office of War Information films can be obtained from 242 different distributors, university film libraries, state and city school systems, commercial film companies, public libraries, and civilian defense councils, throughout the United States, Alaska, Hawaii, and the District of Columbia.)

Ohio Leather Co., 1052 North State St., Girard, Ohio
- The Story of Leather—7 to 800 ft.—16mm.—Silent

Pan American Union, Division of Intellectual Cooperation, Washington 6, D. C.
- The Story of Bananas—16 and 35mm.—Sound
- Rollin' Down to Mexico—16 and 35mm.—Sound
- Native Arts of Old Mexico—16 and 35mm.—Sound
- Picturesque Guatemala—16 and 35mm.—Sound
- Coffee—From Brazil to You—16 and 35mm.—Sound
- By Highway to the Canal—16mm.—Silent—color
- Cordoba—35mm.—Sound
- Buenos Aires—35mm.—Sound
- The Pampa—35mm.—Sound
- Up the River to Iguazu—35mm.—Sound
- The Bright North—35mm.—Sound
- The Great Wall of the West—35mm—Sound

Remington Arms Co. Inc., Bridgeport, Conn.
- Big Fish—12 min.—16mm.—Sound
- Bob White—12 min.—16mm.—Sound

[a] Service charge.

Hunting Thrills—12 min.—16mm.—Sound
Let 'er Buck—12 min.—16mm.—Sound
Pack and Saddle—12 min.—16mm.—Sound
Puttin' on the Dog—12 min.—16mm.—Sound
Snow Thrills—12 min.—16mm.—Sound
Thrills in Wildest Africa—12 min.—16mm.—Sound or silent
Big Game and the National Forests—12 min.—16mm.—Silent
The Buck—12 min.—16mm.—Silent
Camera Thrills in Africa—12 min.—16mm.—Silent
Moose Hunting—12 min.—16mm.—Silent
Snow Partridge—12 min.—16mm.—Silent
Why Save the Elk?—12 min.—16mm.—Silent
Hitting Flying Targets—20 min.—16mm.—Sound
One Man Listens and Opportunity Unlimited—20 min.—16mm.—Sound
The Making of a Shooter—25 min.—16mm.—Sound or silent
A New World Thru Chemistry and Wonder World of Chemistry—20 min.—16mm.—Sound

Society for Visual Education, Inc., 100 East Ohio St., Chicago 11, Ill.
Slide Films on Preinduction Training,
Advertising and Marketing, Aerodynamics,
First Aid, Geography (Commercial),
Geography (Foreign), Geography (Physical),
Geography (U. S.), Geography (American),
History (Commercial), Literature,
Meteorology (Elementary), Nature Study,
Patriotism, Physics, Physical Education,
Primary Reading, Safety, Vocational Training,
Welding (Electric), Woodworkers Tools (Visual Science), etc.

Swift & Company, Union Stock Yards, Chicago 9, Ill.
Hidden Hunger—30 min.—16mm.—Sound
Cows and Chickens—25 min.—16mm.—Sound
A Nation's Meat—30 min.—16mm.—Sound
Livestock and Meat—49 min.—16mm.—Sound

United States Department of Agriculture, Office of Information, Washington, D. C.
A library of educational pictures (16mm. and 35mm. sound and silent) on various phases of agriculture, including crops, livestock, poultry, dairying, forestry, rural engineering, home economics, and related subjects. These films are listed in Miscellaneous Publication No. 451 and Supplements.

United States Department of Labor, Children's Bureau, Washington, D. C.
Films on prenatal care, infant and child care and training, posture, obstetrics, and poliomyelitis

United States Public Health Service, Federal Security Agency (Bethesda Station), Washington 14, D. C.
(Address requests for loans to Surgeon General)
Some of Your Business
Play Safe
Story for Tough Guys
Men of Tomorrow
Men and Machines
On Your Feet—10 min.—16mm.—Sound
Save a Day—10 min.—16mm.—Sound
About Faces—10 min.—16 and 35mm.—Sound
Help Wanted—26 min.—16mm.—Sound

C. L. Venard, Peoria, Ill.
A Stitch in Time—20 min.—16mm.—Sound
The Golden Egg—20 min.—16mm.—Sound
National Farm Oddities—22 min.—16mm.—Sound
Hidden Treasures—60 min.—16mm.—Sound
The Green Hand—86 min.—16mm.—Sound
Under the 4-H Flag—79 min.—16mm.—Sound
Tom, Dick and Harry—50 min.—16mm.—Sound
National Farm Newsreel—17 min.—16mm.—Sound
Keystone Barn Dance Party—13 min.—16mm.—Sound
Steel—Servant of the Soil—41 min.—16mm.—Sound
Southern Sunrise (Color)—20 min.—16mm.—Sound
Also many other films on the subject of American History, Civilization for Life Series, World Travel, Cartoon Comedies, World News and Sports

Vermont Marble Co., Proctor, Vt.
Mountains of Marble—16mm.—Sound

Vocational Guidance Films, Inc., 2708 Beaver Ave., Des Moines 10, Iowa
"Your Life Work" Films covering many subjects including journalism, radio and television, woodworking, automotive service training, electricity, drafting, nursing, engineering, welding, machinery and toolmaking, sheet metal work, the dairy industry, etc. (For further information regarding sales price, etc., write to above distributor)

(*To be continued*)

Eye Troubles of Arc Welders

*Dr. Waldemar Schweisheimer**

Recent Observations About Exposure to Radiant Energy

"Arc flash"—usually an eye inflammation (conjunctivitis) of both eyes is caused by excessive exposure to the welders' electric arc. It is characterized by delayed onset, duration of 24 hours, red eyes, swelling of the lids, slight sunburn of the face, production of tears, dread or intolerance of light, and a feeling of sand in the eyes.

Typical Case of Arc Flash

A typical case of arc flash has been described by Forrest E. Rieke, medical supervisor, Oregon Shipbuilding Corporation and Kaiser Company, Inc. Welding is done in every part of this yard, and at least 30,000 of the 33,000 employees are, at various times of the day or night, exposed to possible eye injuries through radiation.

In a typical case the workman leaves the job in a healthy condition and is entirely unaware that he has received eye injury until he has been at home for several hours. The day shift man usually wakens at midnight or later with painful, sandy, swollen eyes. The workman is rarely sick during the shift in which he has received the ultraviolet overdose. Arc flash is not due to the single bright flash but rather to an accumulated strong exposure.

It is commonplace for workmen to enter the eye treatment room seeking treatment for "arc flash." Examination reveals normal eyes. The workman tells this story: "I have no pain, but I was working near a welder a few minutes ago when he struck an arc. I'm sure I was flashed, so I want some of that medicine put in my eyes which you use to prevent arc flash trouble." "Most of the workmen," Rieke reports, "believe stanchly that there is such a medicine. But there is no such preventive medicine."

The treatment is directed toward relief of local pain, redness and heat, intolerance of light and sandy feeling. For this purpose are used: dark glasses; cold application to the eyes; local anesthetic applied to the eyes; other local efficient solutions such as ephedrine or homatropine, etc.; in severe cases pain-relieving medicines. For control of the trouble protective devices have been employed: calobar type flash goggles with side guards, helmets, welding clothing, screens surrounding the welder at work. Further effective methods are education and instruction in training classes. The most effective educational agent of all in the abolishment of "arc flash" injury has been a personal experience by the individual workman with the exquisite, scratchy pain of the full fledged conjunctivitis. The repeaters are few and they usually have been caught off guard.

Some other remarks of Dr. Rieke. The misconception exists that arc flash injury is more likely to occur at night; he has not found this to be the case. The origin of arc flash is similar to that of snow blindness and sunburn which are related to skin pigmentation and length of time spent in the sun's rays. For this reason it occasionally has been necessary to change the location of work for certain very blond or red-haired workers from shops in which they were constantly bombarded by ultraviolet radiation from near-by welding operations. The oxyacetylene torch does not commonly cause arc flash.

Radiant Energy

The most important exposure to radiant energy, and one which has been increased manyfold by the war effort, is that of ultra-

*New Rochelle, N. Y.

violet, infra-red, and intense visible light radiation from electric welding arcs. The protective devices for controlling these exposures are very effective. The new *Manual of Industrial Hygiene*, edited by W. M. Gafafer, gives a list of

Protection Required for Welding Operations

Operation	*Protection*
Production welding at a permanent location	Permanent shield with proper density light filter; helmet or hand shield with proper density light filter; or goggles with proper density lens.
Working in the vicinity of a welding operation	Goggles or spectacles with No. 3 or No. 4 shade lens
Light gas cutting and welding, light electric spot welding	Goggles or spectacles with No. 5 shade lens
Gas cutting, medium gas welding, arc welding up to 30 amp.	Helmet, shield, or goggles with No. 6 shade filter glass
Heavy gas welding, arc cutting, welding between 30 and 75 amp.	Helmet, shield, or in some cases goggles with No. 8 shade filter glass
Arc welding and cutting between 75 and 200 amp.	Helmet or shield with No. 10 shade filter glass
Arc welding and cutting between 200 and 400 amp.	Helmet or shield with No. 12 shade filter glass
Arc welding and cutting above 400 amp.	Helmet or shield with No. 14 shade filter glass

For continuous exposures to infrared radiation in the heavy metal processing industries, permanent shields and barriers, as well as protective goggles and helms, will serve adequately. Spot cooling, if practicable, is helpful to keep such workers comfortable.

To protect the workers in near-by areas, the manual points out, the welding operations should be shielded as much as possible by means of suitable permanent or portable shields placed about the operation. On the other hand, the welding operation should not be enclosed to such an extent that a serious health hazard to the welder is produced by the reduced ventilation.

Nitrous Gases in Welding

In extensive experiments, Stuart F. Meek, Carey P. McCord, and Gordon C. Harrold, of Detroit, have investigated arc welding in which bare ferrous electrodes were used. They show some doubt on the reliability of those figures now widely accepted as representing the threshold of prospective injury from nitrous gases created in industrial welding. It appears that the zone of beginning danger from nitrous gases lies above 70 parts per million of air and not in the tone of 10 to 40 parts per million. The animals utilized are known to be highly responsive to the action of lung irritants.

Although large quantities of iron fumes were produced along with measurable quantities of manganese fumes from the welding rods, no result has indicated that these fumes are specifically harmful even though discomforting. Ozone, a known irritant, apparently enters into formation of nitrous gases but is not present in the surrounding atmosphere in sufficient concentration to cause harm.

At the present time there is a trend toward the use of coated rods. The prime function of the coating is to provide a gaseous shield about the arc to the exclusion of the atmosphere and to create a slag for the protection of the weld prior to cooling.

Increasing consideration, according to Meek and his collaborators, should be extended to the roles that may be played by oxygen deficiency, manganese, fluorides, zinc, possibly chromium, and some other minerals and metals now gaining in application in arc welding operations. They mention, too, that the high temperature of the arc may transform silicates to more harmful free silica, although no known cases of silicosis have been attributed to this source. They come to the conclusion that no injuries in practical arc-welding operations should axiomatically be associated with nitrous gases as the sole possible cause.

Testing and Tests

FUNDAMENTALS OF SHOPWORK TEST

WM. H. BOWERS
High School
Tuckahoe, N. Y.

U. S. Preinduction PIT 103

Classification of common tools, measuring and gauging, woodwork, metalwork, wiring and splicing, ropes, splices and knots.

Read the following carefully, before starting test.

In the following test are one hundred statements, some true, some false. If, in your opinion, the statement is a true one, place a T before it. If the statement is false, place an F before it.

To determine your rating, subtract 1 per cent for every statement you have answered incorrectly from 100 per cent.

( ) 1. The marking gauge, scriber, knife, and micrometer are known as layout tools.
( ) 2. The square is used by the woodworker, the sheet-metal mechanic, and by the machinist.
( ) 3. The dividers and an outside caliper are used for securing very accurate machine shop measurements.
( ) 4. The surface gauge is used in connection with a round or elliptical surface.
( ) 5. Twist drills are used to make holes in wood in preference to auger bits.
( ) 6. Drill bits are usually held in a brace.
( ) 7. Drills are held in the chuck of hand drills, breast drills, or drill presses.
( ) 8. Wood and rubber mallets are used when driving chisels into metal.
( ) 9. Cutting tools include saws, chisels, knives, and files.
( ) 10. Hack-saw blades are obtainable in only two sizes.
( ) 11. The hack saw is used for cutting metal.
( ) 12. Files are very useful in removing small parts of either wood or metal.
( ) 13. Files are obtainable in only four types and sizes.
( ) 14. Clamps are used for holding together pieces of wood, metal, or other materials.
( ) 15. Round nose pliers are used mainly in the turning of small hems, in metalwork.
( ) 16. Artificial abrasives are made of either silicon carbide, aluminum oxide, or quartz.
( ) 17. A slip stone is usually held by the workman and rubbed over the edge to be sharpened.
( ) 18. Articles of the same size and shape which are made by the thousands are manufactured by machine tools.
( ) 19. Airplanes, guns, and war implements are constructed by mass production methods in our factories.
( ) 20. The skilled machinist is classed as a production man.
( ) 21. A workman after serving a one-year apprenticeship is a machinist.
( ) 22. Machine grinding is a precision process.
( ) 23. The machines that drill holes in airplane engines are capable of drilling fifty holes simultaneously.
( ) 24. The lathe is the most versatile of all the machine tools.
( ) 25. In all lathe turning operations the cutting tool is constantly rotating.
( ) 26. Metal cutting drills rotate at the same time that they are cutting the metal.
( ) 27. Shapers can form almost any straight line cutting surface.
( ) 28. All milling machines' cutters revolve.
( ) 29. Threads and gear teeth can be cut on a milling machine.
( ) 30. When a knife is being sharpened it is correct to use a circular motion.
( ) 31. The correct way to remove rust from a knife blade is to rub the blade with sandpaper.
( ) 32. An electrician uses his knife to remove the rubber insulation from copper wire.
( ) 33. Long nose pliers have long tapering jaws and are always made without cutting jaws.

( ) 34. The tip of a screw driver can be reshaped with a file.
( ) 35. It is good practice to cut spring-steel wire with side cutting pliers.
( ) 36. Heavy insulation on conductor wire is often removed with side cutting pliers by Signal Corps electricians.
( ) 37. The tip of a screw driver is somewhat convex in shape.
( ) 38. Diagonal pliers are made for only one purpose, to be used as cutting tools.
( ) 39. All tools should be used properly and treated carefully to prevent them from rusting.
( ) 40. An instrument that will measure to one sixteenth of an inch is called a precision instrument.
( ) 41. A 6-in. steel rule is classed as a precision instrument.
( ) 42. The rule should be used for measuring purposes only.
( ) 43. Calipers are used for measuring distances and diameters.
( ) 44. They are made in only two styles.
( ) 45. The diameters of copper and steel wire are different, although the gauge number is the same.
( ) 46. The American Standard wire gauge is also called the Brown and Sharpe gauge.
( ) 47. The micrometer is used for determining outside measurements such as the diameter of a piece of steel rod.
( ) 48. The range of a 1-in. micrometer is from 1 to 1½ in.
( ) 49. There are four common types of micrometers.
( ) 50. The thimble on the micrometer is graduated into 28 equal parts.
( ) 51. The try square is used for checking the squareness of large pieces of wood.
( ) 52. The tongue on a framing square is longer than the blade.
( ) 53. The more teeth per inch on a saw, the coarser the cut will be.
( ) 54. When cutting curves on wood the compass saw should be used.
( ) 55. The jointer plane is 15 in. long.
( ) 56. The bevel of a plane iron is approximately 60 deg.
( ) 57. Holes that are not bored completely through the wood are called blind holes.
( ) 58. For boring holes larger in diameter than one inch, the expansive bit is used.
( ) 59. The common chisels are the socket firmer, paring, butt, and the mortise.
( ) 60. A rabbet is a groove made on the edge or end of a piece of wood.
( ) 61. The mortise-and-tenon joint is the strongest joint used in cabinetmaking.
( ) 62. The term "penny" as applied to nails means the number of pounds that 500 nails weigh.
( ) 63. The nail set is used for driving box nails into wood.
( ) 64. When driving screws into hardwood it is advisable to soap the threads of the screw.
( ) 65. In order to increase the strength of glue it is wise to reheat it repeatedly.
( ) 66. A circular motion is advisable when sanding a piece of wood.
( ) 67. To clean shellac, lacquer, and varnish brushes it is necessary to clean them in benzine.
( ) 68. Basically all paints are made with a vehicle and a base.
( ) 69. The DuPont Company are manufacturers of certain types of lacquer.
( ) 70. Filler is used as the final coat, on all varnish jobs.
( ) 71. Tungsten cutting tools will retain their hardness even when they are red hot.
( ) 72. The terms hot rolled and cold rolled come from the condition of the metal at the time of rolling.
( ) 73. When marking lines on metal with a scriber it is best to hold the metal in a vertical position.
( ) 74. Circles are marked on metal with a divider.
( ) 75. A combination set may be used as a marking gauge.
( ) 76. The teeth on a hack saw should point toward the handle.
( ) 77. Draw filing produces a very rough surface on metal.
( ) 78. Soft cast iron, brass, and bronze are drilled with a lubricating oil.
( ) 79. Threads are cut on metal by hand with the use of taps and dies.
( ) 80. Rivets are made of tool steel and vanadium.
( ) 81. The riv-nut is used on surfaces accessible only from one side.
( ) 82. To do a good soldering job it is advisable to heat the soldering copper until it is red hot.
( ) 83. It is advisable to use rosin flux when making a Western Union splice.
( ) 84. The purpose of the grooving tool is to lock two pieces of metal together.
( ) 85. Several coats of aluminum paint make a lasting protective coat on metal.
( ) 86. When bending a loop on the end of a wire, the inside diameter of the loop should be larger than the stud on which it is to fit.
( ) 87. All splices should be mechanically good and immovable after being soldered.
( ) 88. The primary purpose of soldering splices is to make the joint stronger.
( ) 89. The correct manner of covering a splice is by first applying friction tape, then the rubber tape.
( ) 90. The field wire splice used by the U. S. Army for field wiring is insulated with both rubber and fabric.
( ) 91. Western Union splices should be staggered in order to avoid short circuiting.
( ) 92. Ropes are very important in the work of sailors, soldiers, and engineers.
( ) 93. Abaca, or manila fiber, is obtained from Maine, New Hampshire, and Vermont.
( ) 94. Sisal is the strongest fiber used in rope construction.
( ) 95. A bight is formed by bending the rope so that the end is running in the same direction as the rest of the rope.
( ) 96. A hitch is a temporary knot which slips when subjected to strain.
( ) 97. Softness in a rope indicates that the rope has been overstrained and is deteriorating.
( ) 98. A splice properly made is just as strong as any other part of the rope.
( ) 99. Block and tackle, or rigging is used when a load is too much for a man to handle.
( ) 100. Blocks have one, two, three, or four sheaves.

Reference: *Fundamentals of Shopwork*, by Johnson and Newkirk.

KEY FOR TEST
Fundamentals of Shopwork

1. F	21. F	41. F	61. T	81. T
2. T	22. T	42. T	62. F	82. F
3. F	23. T	43. T	63. F	83. T
4. F	24. T	44. F	64. T	84. T
5. F	25. F	45. T	65. F	85. T
6. T	26. T	47. T	66. F	86. F
7. T	27. T	46. T	67. F	87. T
8. F	28. T	48. F	68. T	88. F
9. T	29. T	49. T	69. T	89. F
10. F	30. F	50. F	70. F	90. T
11. T	31. F	51. F	71. T	91. T
12. T	32. T	52. F	72. T	92. T
13. F	33. F	53. F	73. F	93. F
14. T	34. T	54. T	74. T	94. F
15. F	35. F	55. F	75. T	95. T
16. F	36. T	56. F	76. F	96. F
17. T	37. F	57. T	77. F	97. T
18. T	38. T	58. T	78. F	98. F
19. T	39. T	59. T	79. T	99. T
20. F	40. F	60. T	80. F	100. T

POINT SYSTEM TEST

E. J. KRIZ
Senior High School
Dubuque, Iowa

In the blank spaces, write the word or numbers needed to complete the statements correctly.

1. There are ..... points in ½ in.
2. There are ..... picas in a foot.
3. Four nonpareils equal ..... picas.
4. A point is ..... (fractional part) of an inch.
5. Nonpareil type is ..... points.
6. A nonpareil slug is ..... thick.
7. A slug 144 points long is ..... picas long.
8. Three inches equals ..... picas.
9. An inch is ..... picas.
10. An inch contains ..... points.
11. The point size of a pica type is .....
12. Type measuring 14 points from its nick to its back, is known as ..... point type.
13. A slug 18 picas long and six points thick is called a ..... slug.
14. There are ..... nonpareils in a pica.
15. There are ..... points in 3 picas.
16. There are ..... points in two picas.
17. There are ..... picas in one and one half inches.
18. Two nonpareils equal ..... points.
19. ..... em quads of six point type placed side by side will make a line 12 picas long.
20. Two leads and one slug will equal ....., points.
21. An en quad of 8 pt. type contains ..... points.
22. ..... em quads of 8 pt. type could be set in a line 15 picas long.
23. There are ..... points in 2½ picas.
24. ..... 12 pt. em quads could be set in a line 15 picas long.

KEY

1. 36	9. 6	17. 9
2. 72	10. 72	18. 12
3. 2	11. 12	19. 24
4. 1/72	12. 14	20. 10
5. 6	13. nonpareil	21. 4
6. 6	14. 2	22. 22½
7. 12	15. 36	23. 30
8. 18	16. 24	24. 15

Education is the cornerstone, the foundation, the seed corn, of all established business. — *Dr. R. L. Cooley.*

MATCHING TEST ON D.C. MACHINERY

VICTOR J. GUENTHER

Seneca Vocational High School
Buffalo, N. Y.

Select the correct answer from the list of answers, and place its letter in the appropriate space at the left of the test item to which it belongs.

1. ..... What is the purpose of the field rheostat of a generator circuit?
2. ..... What is the purpose of the field rheostat of a motor circuit?
3. ..... How does a d.c. motor differ from a d.c. generator in construction?
4. ..... What is the basic principle of a generator?
5. ..... How does a compound generator differ from a shunt generator in construction?
6. ..... What is one reason that the voltage drops when a shunt generator is loaded?
7. ..... What is meant by differential compound?
8. ..... How do you speed up a shunt motor?
9. ..... What are the characteristics of a shunt motor?
10. ..... What are the characteristics of a series generator?
11. ..... What is residual magnetism?
12. ..... What is a practical method of reversing the direction of rotation of a d.c. motor?
13. ..... What is armature reaction?
14. ..... What would be *two* reasons for a generator not generating?
15. ..... What is meant by torque?
16. ..... How may the torque of a motor be measured?
17. ..... What are *two* causes of a motor sparking at the brushes?
18. ..... What is counter E.M.F.?
19. ..... Under what conditions is a generator said to be separately excited?
20. ..... What one great advantage has a d.c. motor over the ordinary a.c. motor?

List of Answers

A. It is due to the resistance of the armature winding.
B. By increasing the field current.
C. There might be no residual magnetism.
D. By means of a Prony brake.
E. They are built the same.
F. A turning or twisting force.
G. The voltage goes up as a generator is loaded.
H. When a conductor moves in a magnetic field a voltage is generated.
I. The speed goes down as the machine is loaded.
J. By reversing the shunt field terminals.
K. The effect of the current flowing through the armature coils, on the magnetism of the field.
L. To regulate the voltage.
M. Too much resistance in the field circuit.
N. It has an extra field winding in series with the armature.
O. By decreasing the field current.
P. It is the voltage generated in the armature of a motor, which opposes the line voltage.
Q. To increase or decrease the speed.
R. The voltage stays constant when the machine is loaded.
S. When the commutator is rough or uneven.
T. The speed can be easily regulated.
U. When the magnetism of the series field opposes or weakens that of the shunt field.
V. The small amount left in the field poles after the current is off.
W. When there is an open circuit in the armature.
X. By reversing the line terminals (L1 & L2).
Y. When it gets its field current from another machine.
Z. No correct answer given.

MECHANICAL DRAWING TEST

H. G. STINTSMAN

East Side Commercial and Technical High School
Newark, N. J.

Most courses in mechanical drawing devote some time to a unit on screw threaded fasteners.

The following test is given after the students have completed our unit on fasteners.

This is a multiple-choice test. There are four statements to each problem. Read each statement thoughtfully, then place the letter which appears before the answer that you think is the correct one on the answer sheet. The teacher will provide you with an answer sheet.

Sample: The T square is used to draw:
a) circles
b) arcs
c) vertical lines
d) horizontal lines

d would be the letter placed on the answer sheet.

1. Drawings that give complete information regarding the individual parts of a machine or structure are called:
a) assembly drawings
b) isometric drawings
c) detail drawings
d) oblique drawings
2. Drawings that show the various parts combined as they will appear in the finished machine are called:
a) detail drawings
b) isometric drawings
c) cabinet drawing
d) assembly drawings
3. The crest and root of the American Standard thread:
a) are flattened to one eighth the pitch
b) are flattened to one fourth the pitch
c) are equal to one third pitch
d) are equal to twice the lead
4. Square threads are used:
a) only with square nuts
b) for machines used in arctic zones
c) for transmitting power
d) on a buttress thread
5. The distance across the flats of a regular square bolt head is equal to:
a) two times D
b) one half D
c) one and one half D
d) seven eighths D
6. The thickness of the bolt head on a regular hexagonal headed bolt is equal to:
a) one half D
b) two thirds D
c) diameter
d) three eighths D
7. The Acme thread has a depth equal to:
a) three fourths of pitch
b) to pitch
c) one and one half pitch
d) one half of pitch
8. Studs are used on parts such as covers and auto motor manifolds:
a) which will be removed frequently
b) to save aluminum
c) to save rubber
d) which are made from wood
9. The pencil to be used for technical sketching should be a:
a) 6H
b) 3B
c) H
d) 5H
10. The best type of paper for technical sketching is:
a) cross section paper
b) tracing paper
c) blueprint paper
d) cardboard
11. The section lines on the "Symbols for Materials in Section" were made on a:
a) 60-degree angle
b) 45-degree angle
c) 22½-degree angle
d) 75-degree angle
12. When drawing a helix, the circumference is divided into the same number of equal parts as:
a) the diameter
b) the radius
c) the pitch
d) the chord
13. The depth of a square thread is equal to:
a) one half of pitch
b) to pitch
c) twitch pitch
d) three fourths of pitch
14. The thickness of a regular hexagonal nut is equal to:
a) one and a fourth D
b) one half D
c) seven eighths D
d) thickness of the bolt head
15. Regular bolts are threaded a distance from the end equal to:
a) one and one half D + ¼ in.
b) D
c) two times D
d) one and one quarter D
16. A left-handed thread advances when turned:
a) counterclockwise
b) clockwise
c) the same direction as the second hand
d) toward the north
17. The cylindrical helix is the basis:
a) of detail drawings
b) of assembly drawings
c) of the screw thread
d) of French curves
18. The head of a fillister headed cap screw will require a:
a) counter sunk hole
b) counter-bored hole
c) tapped hole
d) countersign
19. Cap screws are used for fastening two pieces together by passing through a clearance hole in one piece and:
a) a drilled hole in the other
b) a ground hole in the other
c) into a tapped hole in the other
d) a square hole in the other
20. Long objects drawn full scale and having uniform shape can be placed upon the drawing sheet with the aid of:
a) auxiliary views
b) conventional breaks
c) blueprinting
d) colored ink
21. The "preferred projections" that we drew and studied are used instead of:

a) the picture drawing
b) the correct projection
c) the symbols
d) the inked drawing

22. When a cutting plane passes through spokes or ribs, the section lines are usually:
a) drawn at 45 degrees
b) omitted
c) drawn vertically
d) long and equally spaced

23. A cutting plane line consists of:
a) two short dashes and two long dashes
b) one short dash and one long dash
c) two short dashes and one long dash
d) all short dashes

24. On a double thread the:
a) lead equals pitch
b) lead equals three times pitch
c) lead equals twice pitch
d) diameter equals pitch

25. When turned clockwise a right-hand thread:
a) will screw out of a tapped hole
b) will advance into a tapped hole
c) will make the thread bind
d) equals the speed of a second hand on a watch

KEY

1.	c	6.	b	11.	b	16.	b	21.	a
2.	d	7.	d	12.	c	17.	c	22.	b
3.	a	8.	a	13.	a	18.	b	23.	c
4.	c	9.	c	14.	c	19.	c	24.	c
5.	c	10.	a	15.	a	20.	b	25.	b

WOODWORKING TESTS NO. 1 AND NO. 2

RALPH BERRY
Elementary School
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Test No. 1

Directions: Circle the number of the most correct answer to each statement.

Tools

1. A jackplane has
(1) One lateral and one depth adjustment (2) One depth adjustment (3) One lateral adjustment

2. In cutting a 14-in. board to 12 in. in width a
(1) Buck saw is used (2) Rip saw is used (3) A cross cut saw is used

3. A ¾-in. auger bit is found by the
(1) Number 8 on the shank (2) Number 14 on the shank (3) Number 12 on the shank

4. A tool used to drive finishing nails below the surface of wood is called
(1) Nail punch (2) Nail driver (3) Nail set

5. The letters r.h.b. refer to
(1) Screws (2) Roundhead bright screws (3) Roundhead blue screws

6. A saw used to cut a board to a length of 30 in. is called a
(1) Buck saw (2) Rip saw (3) Cross cut saw

7. A wood file is cleaned with a
(1) File brush (2) File card (3) Steel brush

8. If small pieces of wood are to be planed use a
(1) Smoothing plane (2) Small plane (3) Block plane

9. The correct angle to hold a cross cut saw to the work is
(1) 45° (2) 10° (3) 90°

10. The saw used to cut fine accurate straight cuts in thin wood is a
(1) Cross cut saw (2) Coping saw (3) Back saw

11. If a quarter of a circle is to be drawn on wood use a
(1) Dividers (2) Compass (3) Pencil and ruler

12. A tool for cutting round holes from 1 to 3 in. in diameter is called a
(1) Expansive bit (2) Auger bit (3) Keyhole saw

13. A spokeshave, when used to plane curving edges, is
(1) Pushed away from person operating (2) Pulled toward person operating (3) Will not plane a curve

14. The file used to smooth curves in thin wood is called a
(1) Mill file (2) Cabinet file (3) Wood rasp

15. When striking a wood chisel use a
(1) Ball-peen hammer (2) Mallet (3) Cross peen hammer

16. Wood drill sizes are indicated by
(1) 16ths of an inch (2) 32nds of an inch (3) 8ths of an inch

17. When planing wood, it is held in
(1) Clamp (2) Bar clamp (3) Vise

18. A brace is used to hold a/an
(1) Bit (2) Wood drill (3) Auger bit

Fasteners

19. If a small nail is to set below the surface of wood use a
(1) Box nail (2) Barbed nail (3) Brad

20. The following commodity is usually sold by the pound
(1) Nails (2) Screws (3) Corrugated fasteners

21. The following commodity is usually sold by the gross
(1) Carriage bolts (2) Nails (3) Screws

22. Corrugated fasteners are usually driven with a
(1) Ball-peen hammer (2) Mallet (3) Claw hammer

23. When the bottom of the head of a wood screw is to be flush with the surface of wood, use
(1) Roundhead screws (2) Flathead screws (3) Ovalhead screws

24. When the numbers 1½ x 10 appears on a label it means
(1) Wood screws (2) The article is 1½ in. long and 10-wire gauge in diameter (3) Nails

25. Square butt joints may be reinforced by
(1) Nails (2) Dowels (3) Screws

26. The terms flathead, ovalhead, and roundhead refer to
(1) Carriage bolts (2) Common nails (3) Wood screws

27. The smallest size of finishing nail is
(1) 5d (2) 1d (3) 2d

28. Nails resembling common nails but much smaller are
(1) Brads (2) Wire nails (3) Cabinet nails

29. The term that designates nail sizes is
(1) d (2) p (3) Penny

Finishes

30. Alcohol is used to cut
(1) Shellac (2) Varnish (3) Paint

31. When a hand scraper is used to smooth wood, it is used
(1) Across the grain of the wood (2) Cannot be used (3) With the grain of the wood

32. Turpentine is used to thin
(1) Shellac (2) Paint (3) Lacquer

33. No. ½ sandpaper is
(1) Very smooth (2) Very rough (3) Medium

34. Lacquer is thinned with
(1) Lacquer thinner (2) Thinner (3) Alcohol

35. When sanding deep scratches and very rough spots use
(1) No. 2 sandpaper (2) No. 2/0 sandpaper (3) No. 6/0 sandpaper

36. The part of the wood that stains the darkest is
(1) End grain (2) The edges (3) The surfaces

37. The color of unbleached shellac is
(1) White (2) Clear (3) Orange

38. The shellac to use for a clear finish is
(1) White (2) Clear (3) Orange

39. A sealer applied to end grain just before staining with oil stain is
(1) Sanding sealer (2) Varnish (3) Linseed oil

40. A material used to fill cracks in wood is
(1) Imitation wood (2) Powder (3) Plastic wood

Procedures and Lumber

41. Dimensions for lumber are given in the following order
(1) Width, thickness, and length (2) Thickness, length, and width (3) Thickness, width, and length

42. A bevel is cut with a
(1) Coping saw (2) Plane (3) Scraper

43. The term groove refers to
(1) A type of cut (2) A kind of wood (3) A type of plane

44. To set the head of a f.h.b. screw use a
(1) Spokeshave (2) Screw driver (3) Countersink

45. Two right angles contain
(1) 45 deg. (2) 90 deg. (3) 180 deg.

46. Lumber is sold by
(1) The square foot (2) The board foot (3) Pound

47. A standard board foot has the following dimensions
(1) 1″ x 12″ x 12″ (2) 2″ x 8″ x 12″ (3) 2″ x 6″ x 12″

48. There are 5 board feet in a piece of lumber of the following dimensions
(1) 1″ x 10″ x 60″ (2) 1″ x 12″ x 48″ (3) 1″ x 12″ x 60″

49. A board 1″ x 18″ x 30″ contains
(1) 3¾ board feet (2) 5 board feet (3) 3 board feet

50. There are 12 board feet in the pieces of lumber of the following dimensions
(1) 2 pcs. 3″ x 10″ x 24″ (2) 4 pcs. 1″ x 6″ x 60″ (3) 3 pcs. 2″ x 8″ x 36″

KEY FOR TEST NO. 1

1.	(1)	11.	(2)	21.	(3)	31.	(3)	41.	(3)
2.	(2)	12.	(1)	22.	(3)	32.	(2)	42.	(2)
3.	(3)	13.	(1)	23.	(1)	33.	(3)	43.	(1)
4.	(3)	14.	(2)	24.	(2)	34.	(1)	44.	(3)
5.	(3)	15.	(2)	25.	(2)	35.	(1)	45.	(3)
6.	(3)	16.	(2)	26.	(3)	36.	(1)	46.	(2)
7.	(2)	17.	(3)	27.	(3)	37.	(3)	47.	(1)
8.	(3)	18.	(3)	28.	(2)	38.	(1)	48.	(3)
9.	(1)	19.	(3)	29.	(3)	39.	(3)	49.	(1)
10.	(3)	20.	(1)	30.	(1)	40.	(3)	50.	(3)

Test No. 2

Directions: Make each sentence a true statement by inserting the proper word or words in the blank spaces.

Tools

1. A smoothing plane has ..... adjustments.

2. A ..... saw is used to cut a board to width.

3. Number ..... will be found on the tang of a ½ in. auger bit.

4. A ..... is used to drive a nail below the surface of wood.

5. The letters f.h.b. mean .....

6. A ..... saw is used to cut a board to length.

7. A ..... is used to clean a wood file.
8. A ..... plane is used for smoothing small straight surfaces.
9. The starting cut of a crosscut saw should be on the ..... stroke.
10. ..... are used to cut curves in thin wood.
11. Circular lines are made with a .....
12. The tool for cutting various sizes of round holes in wood from ¼ to 1 in. in diameter is called an .....
13. A curving edge may be planed with a .....
14. A ..... is used to smooth sharp curves in thin wood.
15. A ..... is used to hammer on a chisel.
16. Auger bit sizes are designated by ..... of an inch.
17. Wood is held rigid for planing the edges with a .....
18. A wood drill is held in a .....

Fasteners

19. ..... nails are set below the surface of the wood.
20. Nails are usually sold by the .....
21. Screws are usually sold by the .....
22. Nails are usually driven with a .....
23. When the head of a screw is to be left level with or a little below the surface of the wood, use a ..... screw.
24. Screw sizes are designated by length in ..... and the diameter of the body by ..... number.
25. Square butt joints may be reinforced by the use of ..... fasteners.
26. Two types of wood screws according to the heads are ..... and .....
27. The smallest size of common nails is .....
28. Nails resembling finishing nails but much smaller are called .....
29. The symbol that designates penny in nail sizes is .....

Finishes

30. Shellac is thinned with .....
31. Boards should be sandpapered with the ..... of the wood.
32. Paint is thinned with .....
33. No. 3 sandpaper is very .....
34. Lacquer is thinned with .....
35. No. ..... sandpaper is used to finish sanding wood.
36. End grain usually stains ..... than surfaces and edges.
37. Natural shellac is ..... in color.
38. After shellac has been bleached it is called ..... shellac.
39. ..... applied to the end grain of wood prevents it from becoming too dark when oil stain is applied.
40. ..... has the same properties as wood and is used to fill holes and breaks in wood.

Procedures and Lumber

41. Dimensions for lumber are given in the following order (1) ....., (2) ....., and (3) .....
42. Chamfers are cut with a .....
43. The term mortise and tenon refers to a type of .....
44. The ..... is used to bore the hole allowing the head of a flathead screw to be set below the surface of the wood.
45. An angle of 90 degrees is called a ..... angle.
46. Lumber is sold by the .....
47. A board foot is ..... thick, ... wide and ..... long or its equivalent.
48. A piece of wood 2 in. thick, 6 in. wide, and 48 in. long contains ..... board feet.
49. A board 2 in. x 10½ in. x 48 in. contains ..... board feet.
50. A board 2 in. x 8 in. x 6 ft. contains ..... board feet.

KEY FOR TEST NO. 2

1. two
2. rip
3. eight
4. nail set
5. flathead bright screws
6. cross cut
7. file card
8. block
9. back
10. coping saws
11. compass
12. auger bit
13. spokeshave
14. cabinet file
15. mallet
16. 16ths
17. vise
18. hand drill
19. finishing
20. pound
21. gross
22. claw hammer
23. flathead
24. inches, gauge
25. corrugated
26. flathead, round-head
27. two penny
28. brads
29. d
30. alcohol
31. grain
32. turpentine
33. rough
34. lacquer thinner
35. 2/0 to 6/0
36. darker
37. orange
38. white
39. linseed oil
40. Plastic Wood
41. thickness, width and length
42. plane
43. joint
44. countersink
45. right
46. board foot
47. 1 in., 12 in., 12 in.
48. four
49. seven
50. eight

TEST IN ELEMENTS OF AERONAUTICS

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Of the following 99 statements, some are true, others are false. If, in your opinion, the statement is true, place a *T* after it. If it is a false statement, place an *F* after same.

1. It is estimated that 80,000 planes will be made in the U. S. in 1943.
2. The production of commercial planes decreased 40 per cent in 1941 and 1942.
3. High paying positions abound in the aircraft industry.
4. The Montgolfier brothers were pioneers in balloon aeronautics.
5. In 1908 Glen Curtiss won the Scientific American Trophy, flying at a speed of 76 miles an hour.
6. In May, 1927, Col. Lindberg made the first nonstop flight from U. S. to Europe.
7. In July, 1938, Howard Hughes, with four companions, flew around the world in 3 days, 19 hours, and 8 minutes.
8. The arrangement of struts used for bracing an airplane are called Camber.
9. After its construction is finished the plane is finally tested in a wind tunnel.
10. Igor Sikorsky is a pioneer in developing the helicopter.
11. Many biplanes are used by the U. S. Navy.
12. Military planes are classed according to the work they are to do.
13. Bombers and Pursuit planes are often used for dive bombing.
14. Gravity is the earth's natural attraction for all objects.
15. Both the U. S. Army and the U. S. Navy use the same system of designating planes.
16. In the Army system the first letter indicates the model of the plane.
17. In the Navy system of designation the plane manufacturer is revealed.
18. The symbol *B* reveals that the plane is a U. S. Navy aircraft.
19. The symbol *BLR* is a Navy designation.
20. The symbol *PB* is the U. S. Army pursuit, two seat airplane.
21. The symbol *Y* indicates a Curtiss Wright plane.
22. The symbol *M* is a Douglas ship.
23. The symbol *O* indicates a Lockheed craft.
24. The British Spitfire is rated as the best single seat fighter in the world.
25. The Hawker Hurricane is powered by a Pratt & Whitney engine.
26. The Messerschmitt Me 109E is a multi engine bomber.
27. The Junkers JU 88-A1 is the fastest pursuit plane in the Luft-Waffe.
28. The Lockheed P-38 is the fastest single seat twin engine fighter in the world.
29. The Airacobra P-39 is a single seat, one engine fighter powered with an air cooled Allison engine.
30. The Savoia-Marchetti 85 is a very efficient Italian fighter and dive bomber.
31. The Mitsubishi 96, powered with four 850 h.p. engines has a range of 27,000 miles.
32. The Fokker D21 is a Dutch plane.
33. It is necessary to have a pilot certificate to fly a plane.
34. A certificate covering a commercial pilot's rating, also allows the pilot to fly a glider.
35. Seventy-five hours of solo flying are required in order to obtain a private flying certificate.
36. Permanent certificates are granted by the Civil Aeronautic Authority.
37. Defense Aircraft Certification is obtained through the Civil Aeronautic Authorities.
38. The identification marks *NC* indicate a certificated aircraft which has fully complied with the C. A. A. requirements.
39. Army and Navy flying cadets receive nine months' training.
40. Completion of 675 hours flying is a requirement in the flying cadet's training period.
41. All lights required for night flying must be visible for five miles.
42. When two planes are approaching *head on* they must be separated by 1000 feet.
43. The *stick* controls both the ailerons and the elevators.
44. The flaps used when landing work individually.
45. The flaps are located along the leading edges of both wings.
46. The engine is wide open when the throttle is pushed full ahead.
47. A plane will level off if the *stick* is pushed into neutral position.
48. Pushing on the right rudder pedal moves the rudder to the right.
49. When landing, choose a runway pointing up wind.
50. A speed of seventy-five miles an hour must be attained before the pilot can take off.
51. Avigation is a term applied to aerial navigation.
52. Dead reckoning refers to the art of flying by means of visible landmarks.
53. Piloting means flying by chart and compass.
54. Radio avigation refers to the use of the radio in getting to a destination.
55. One statute mile (land) equals 5296 feet.
56. A nautical mile is 3.15 times greater than a statute mile.
57. The *Tachometer* measures the speed of the plane through the air.
58. The *Air Speed Indicator* tells the altitude of the plane.
59. Algebra, geometry, and trigonometry are basic studies in navigational computation.
60. Fog, strong winds, icing, clouds, and thunder storms are weather hazards often fatal to air craft.

61. All planes are equipped with special flying instruments.
62. A cloud which comes right down to the earth is called a fog.
63. A meteorologist is on duty at each of the principal air ports in the U. S.
64. Weather service comes under the jurisdiction of the C. A. A.
65. A pilot always follows the judgment of the meteorologist.
66. The best time to start a trip in a plane is about 10:30 a.m.
67. The air is smoothest on an overcast day.
68. When ice forms on the wings of a plane a forced landing is always necessary.
69. Thunderstorms are usually local affairs which permit the pilot to fly around them.
70. The safety of the crew and passengers depends entirely upon the work of each individual airplane mechanic.
71. The best mechanics are proficient both in the use of hand tools and machine manipulation.
72. The mechanic's decisions are always influenced by the foreman's wish.
73. Precision work is absolutely necessary.
74. Employment managers demand proof that the mechanic is capable before hiring him.
75. To work in a small plant a mechanic must have all around ability.
76. Tension is a crushing force.
77. "Shear" pulls a material apart.
78. Torsion is a twisting force.
79. There are seven principal types of wing construction.
80. The spars are the principal support of the wing covering.
81. Alloys of copper and iron predominate in air craft construction.
82. Seamless tubing is obtainable in a variety of sizes and alloys.
83. Forgings are machined in the machine shop to give the metal added strength.
84. Castings are made from wood patters only.
85. Alclad is a trade term of a specially treated copper product.
86. Stainless steel is a steel alloy composition, of low carbon steel, chromium, and nickel.
87. An aircraft cable is made of brass.
88. Bolts are of a uniform standard in the air craft industry.
89. Dope is a composition of nitric acid and gun powder.
90. All aircraft engines are internal combustion engines.
91. The opposed engine, used on light crafts has six cylinders.
92. In the "Exhaust Stroke Cycle" the exhaust valve is closed and as the piston returns upward the burned gases are forced out of the cylinder.
93. The radial engine ranges from 30 to 1000 h.p.
94. Engines 1000 h.p. and up, have either floatless variable venturi carburetors, or they are of the injection type.
95. The magneto furnishes the source of the electrical power supply on an airplane.
96. All airplane engines are hand lubricated.
97. The cartridge resembles a shot gun shell and is fired by a trigger.
98. The pitch of the blades on a full feathered propeller is changed by oil pressure.
99. Routine engine checks are made after each 10, 20, 30, 50 and 100 hours of operation.

References

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The Elements of Aeronautics, Pope and Otis, Yonkers, N. Y.

KEY

1.	F	18.	F	35.	F	52.	T	68.	F	84.	F
2.	F	19.	F	36.	T	53.	F	69.	T	85.	F
3.	T	20.	T	37.	F	54.	T	70.	T	86.	T
4.	T	21.	F	38.	T	55.	F	71.	T	87.	F
5.	F	22.	F	39.	T	56.	F	72.	F	88.	T
6.	T	23.	T	40.	F	57.	F	73.	T	89.	T
7.	T	24.	T	41.	F	58.	F	74.	T	90.	T
8.	F	25.	T	42.	F	59.	T	75.	T	91.	F
9.	F	26.	F	43.	T	60.	T	76.	F	92.	F
10.	T	27.	F	44.	F	61.	F	77.	F	93.	F
11.	T	28.	T	45.	F	62.	T	78.	T	94.	T
12.	T	29.	F	46.	T	63.	T	79.	F	95.	T
13.	F	30.	T	47.	T	64.	F	80.	F	96.	F
14.	T	31.	F	48.	T	65.	F	81.	F	97.	T
15.	F	32.	T	49.	T	66.	F	82.	T	98.	T
16.	F	33.	T	50.	F	67.	T	83.	F	99.	T
17.	T	34.	F	51.	T						

MACHINE-SHOP TEST

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General Directions: This test will take approximately forty minutes. Read the directions for each part carefully. It will not be necessary to ask any questions.

Part I — Yes-No Test

Directions for Items 1–25: Several questions follow, some of which should be answered by yes and others by no. If the answer is yes, draw a circle around the capital letter Y at the left, and if no, circle the capital letter N. Your score will be the number right.

Example: (Y) N Does a machinist's hammer have a wood handle?

1. Y N Does a mechanical drawing show hidden parts by a broken line?
2. Y N Should one screw driver be ground so that it will fit all sizes of screws?
3. Y N Is there any danger of overheating a tool bit when you are grinding it?
4. Y N Are sharp tools necessary to produce a good finish?
5. Y N Does N. C. mean not correct?
6. Y N Are fine threads used in automotive work?
7. Y N Are course threads used for general work?
8. Y N Does a right hand thread lead to the right?
9. Y N Is the thread on a nut an internal thread?
10. Y N Is a spur gear a wheel with teeth on its circumference?
11. Y N Is a pinion a small spur gear?
12. Y N Are acme and square screw threads used for transmitting motion such as lead screw and cross feed screw of a lathe, also for exerting force as in jack screws, vises, and clamps?
13. Y N Can parts be assembled and then taken apart without damage when assembled with screws and bolts?
14. Y N Is the principle of the screw thread used in precision measuring instruments, such as micrometer calipers, the same as that used on the cross feed slide of the lathe?
15. Y N Can the gearing between the headstock spindle and lead screw be arranged so that any desired pitch of the screw thread may be cut?
16. Y N Can you cut a left hand thread by running your lathe in reverse?
17. Y N Is it possible to grind the cutting tool to the shape required for the form of the thread to cut like the acme and square screw thread?
18. Y N Is the lead the distance a screw thread will advance axially in one turn?
19. Y N Is the American National Coarse Thread Series formerly the S.A.E.?
20. Y N Would you use a center gauge for testing a 60-deg. angle of tool bit ground for cutting a N.F. screw thread?
21. Y N Should the top of the tool bit be set exactly on center for cutting screw threads?
22. Y N Would you set the compound rest at 29 degrees for cutting the American National Form Thread?
23. Y N Would you use cutting oil when cutting threads in steel?
24. Y N Does F. stand for form in figuring a National Coarse Screw Thread?
25. Y N Is the width of a square thread tool equal to the pitch of the thread?

Perfect Score 25 Student's Score.....

KEY

1.	Y	6.	Y	11.	Y	16.	N	21.	Y
2.	N	7.	Y	12.	Y	17.	Y	22.	Y
3.	Y	8.	N	13.	Y	18.	Y	23.	Y
4.	Y	9.	Y	14.	Y	19.	N	24.	Y
5.	N	10.	Y	15.	Y	20.	Y	25.	N

Part II — True-False

Directions for Items 26–50: Read each of the following items and decide whether it is true or false. If the item is true, draw a circle around the capital letter T at the left, if the item is false circle the capital letter F. Your score will be the number right.

Example: (T) F A machinist's hammer has a wood handle.

26. T F When the diameter of the work to be center drilled is 3/8 to 1 in. in diameter, the large diameter of the countersunk hole should be about 3/16 in.
27. T F To clean and oil a machine, use waste or rags moistened with kerosene to cut the grease and then apply a thin film of machine oil.
28. T F Facing is never called squaring.
29. T F A working drawing should have all the information necessary for doing the job.
30. T F Steel surfaces are coated with purple layout dye before laying out the job.
31. T F The adjustable hand hack-saw frame will take a 14-in. blade.
32. T F The decimal equivalent of 3/8 is .375.
33. T F The file is a very useful tool for fitting and shaping metal parts when machine tools are impractical.
34. T F Most manufacturers of lathes and drill presses use the Morse Standard Taper in the spindles.
35. T F The micrometer collar on the cross slide may be used for accurately setting over the tailstock for taper turning.
36. T F Speed is expressed in r.p.m.
37. T F Feed means the amount the tool advances for every two revolutions of the work.
38. T F Most work requires filing in the lathe.
39. T F A lathe should be stopped by using the hand as a brake against the cone pulley.
40. T F Rags should never be used for wiping any moving part while the milling machine is in motion.
41. T F The tool for cutting an American National form thread is ground to 60 deg.

42. T F When cutting screw threads in steel, always keep the work flooded with lard oil, cutting oil, or cutting compound.
43. T F A screw thread is a ridge of uniform section in the form of a helix on the surface of a cylinder or cone.
44. T F ½ in.–13 is an American National fine thread series.
45. T F For the cutting of internal threads the top of the tool should be placed a little above center.
46. T F For the cutting of external threads the point of the threading tool is placed a little below center.
47. T F 29 degrees is the correct angle of the compound rest for cutting National Form Threads on the lathe.
48. T F A thread dial indicator is usually used for cutting long screw threads.
49. T F The end of the thread should be finished with a 45-deg. chamfer.
50. T F A pinion is a large spur gear.

Perfect Score 25 Student's score.....

KEY

26.	T	31.	F	36.	T	41.	T	46.	F
27.	T	32.	T	37.	F	42.	T	47.	T
28.	F	33.	T	38.	F	43.	T	48.	T
29.	T	34.	T	39.	F	44.	F	49.	T
30.	T	35.	T	40.	T	45.	F	50.	F

Part III — Matching

Directions for Items 51–60: In the following two columns there are listed common machine-shop terms. Place in the parenthesis in front of the phrase in column 1 the identifying letter of the word or phrase in column 2 which is most closely related in meaning. Use each letter but once. Your score will be the number of right answers.

Example: (N) A tool used for drilling center holes.
(N) Combination drill and countersink.

Column 1

51. ( ) Formerly called S.A.E. form of thread.
52. ( ) 29-deg. thread.
53. ( ) Turns in the direction of the clock.
54. ( ) Formerly called U. S. Standard form of thread.
55. ( ) A thread on the outside of a cylinder.
56. ( ) Diameter measured at the bottom of the thread.
57. ( ) A thread on the inside of a member.
58. ( ) Distance that the screw thread advances in one turn.
59. ( ) Turns counterclockwise when screwed into a nut.
60. ( ) Distance from the middle point of one screw thread to the middle point of the next thread measured parallel to the axis.

Column 2

A. Acme thread	H. N.C. thread
B. Depth	J. Pitch
C. External thread	K. R. H. thread
D. Internal thread	L. Root
E. Lead	M. Root diameter
F. L. H. thread	N. N.F. threads
G. Major diameter	O. Square threads

Perfect Score 10 Student's Score.....

KEY

51.	N	53.	K	55.	C	57.	D	59.	F
52.	A	54.	H	56.	M	58.	E	60.	J

Part IV — Multiple-Choice

Directions for Items 61–85: Each of the following items has four alternative answers, only one of which is correct. Underline the correct answer and write its number in the parenthesis at the left. Your score will be the number of right answers.

Example: (1) A machinist's hammer has a (1) *wood*, (2) metal, (3) leather, (4) plastic handle.

61. ( ) Steel surfaces that are to be laid out should be coated with (1) purple layout dye, (2) chalk, (3) vermilion, (4) red lead.
62. ( ) The use of guide lines is (1) unnecessary, (2) advisable, (3) not important, (4) very essential when stamping.
63. ( ) The hand hack saw should be operated at (1) 20, (2) 40, (3) 60, (4) 80 strokes per minute.
64. ( ) The beveled edge of the thimble on the micrometer caliper is divided into (1) 25, (2) 20, (3) 5, (4) equal part or parts.
65. ( ) If a drill is not stamped "H.S." it is made of (1) carbon steel, (2) cold-rolled steel, (3) cold-drawn steel, (4) high-speed steel.
66. ( ) The combination drill and countersink is always ground at (1) 40 deg. (2) 50 deg. (3) 82 deg. (4) 60 deg.
67. ( ) In truing a live lathe center the compound rest is set at (1) 40 deg. (2) 50 deg. (3) 30 deg. (4) 60 deg. with the center line of the lathe.
68. ( ) There are (1) three, (2) two, (3) one, (4) four grades of knurling.
69. ( ) A greater number of threads per inch is found on the (1) National coarse, (2) National fine, (3) Extra fine, (4) National thread.
70. ( ) The National coarse thread corresponds to the old (1) S.A.E., (2) U.S.S., (3) Briggs, (4) N.P.T.
71. ( ) The compound rest of the lathe should be set at (1) 32 deg. (2) 31 deg. (3) 33 deg. (4) 29 deg. when cutting National Form threads.
72. ( ) Cutting oil should be used when cutting screw threads in (1) brass, (2) cast iron, (3) steel, (4) copper.
73. ( ) When cutting all even numbered threads on the lathe, close the half nuts (1) at any line on the thread dial indicator, (2) at any numbered line, (3) at any odd number line.
74. ( ) The head of a bolt is chamfered at (1) 35 deg. (2) 25 deg. (3) 45 deg. (4) 22 deg.
75. ( ) The Acme screw thread is a (1) 59 deg. (2) 39 deg. (3) 49 deg. (4) 29 deg. thread.
76. ( ) The depth of a square thread is equal (1) ½ pitch, (2) ¼ pitch, (3) twice the pitch, (4) to the pitch.
77. ( ) Shapers are particularly suitable for (1) long work, (2) short work, (3) very long work.
78. ( ) If a gear has 48 teeth and is 4 in. in diameter it is a (1) 10, (2) 12, (3) 24, (4) 36 pitch gear.
79. ( ) A small spur gear is often called (1) hub, (2) spindle, (3) pitch, (4) pinion.
80. ( ) Allowance for milling bolt heads and nuts is (1) .008 to .010, (2) .005 to .007, (3) .002 to .004, (4) .001 to .002.
81. ( ) You can count screw threads with a (1) tap, (2) nut, (3) die, (4) screw pitch gauge.
82. ( ) A right hand screw enters the nut when rotated to (1) right, (2) left, (3) counterclockwise.
83. ( ) A plan view of a tapped hole is usually indicated by (1) two full circles, (2) a full circle inside a dashed one, (3) a single, heavy line, (4) a double, light line.
84. ( ) The point of the threading tool is ground to (1) 45 deg. (2) 30 deg. (3) 60 deg. (4) 49 deg. for machining American National Form Thread.
85. ( ) It is not necessary to use cutting oil when cutting screw threads in (1) cast iron, (2) cold-rolled steel, (3) tool steel, (4) machine steel.

Perfect Score 25 Student's score.....

KEY

61.	(1)	66.	(4)	71.	(4)	76.	(1)	81.	(4)
62.	(4)	67.	(3)	72.	(3)	77.	(2)	82.	(1)
63.	(2)	68.	(1)	73.	(1)	78.	(2)	83.	(2)
64.	(1)	69.	(3)	74.	(3)	79.	(4)	84.	(3)
65.	(2)	70.	(2)	75.	(4)	80.	(3)	85.	(1)

Part V — Completion

Directions for Items 86–110: Place the correct word in the blank space to make the sentence complete and correct. The figure in the parenthesis indicates the number of letters in the answer. Your score will be the number of correct answers.

Example: A machinist's hammer has a *wood* (6) handle.

86. Jobs that will not fit on the drawing paper are drawn to ..... (5).
87. In making out a bill of material you will learn to read a ..... (7) drawing.
88. A rule is a measuring instrument made of wood ....., (5) or paper.
89. The power hack-saw blade should be strained rigidly in the ..... (5).
90. Steel surfaces which are to be laid out should be coated with ..... (6) layout dye.
91. The spiral grooves of a twist drill are called ..... (6).
92. A small piece of waste moistened with ..... (8) will serve to cut the dirt and grease when cleaning a machine.
93. To machine a job on centers in the lathe it is necessary that holes be drilled in each end of the work so it can ..... (7) on the lathe centers.
94. Tap sets are made in taper ..... (4) and bottoming taps.
95. In soft or brittle metal one should use a ..... (6) thread.
96. With the use of screw and bolts, parts which are assembled can be easily assembled and taken apart without ..... (6).
97. A ..... (6) gauge is used for checking the angle of a tool bit for cutting a N.C. thread.
98. The top of the tool bit should be set on ..... (6) for cutting screw threads.
99. Cutting oil should be used when cutting threads in ..... (5) in order to produce smooth threads.
100. A thread dial indicator or ..... (9) clock is usually used for cutting screw threads.
101. A ..... (4) hand screw is one that turns counterclockwise when advancing into a nut.
102. Taps and dies are often used for cutting threads in the ..... (5).
103. A lathe should be stopped by shutting off the ..... (5) and allowing the lathe to stop of its own accord.
104. While working at the lathe one must keep his sleeves rolled up because it is ..... (6) to work with long sleeves.
105. A threaded plug is an example of an ..... (8) thread.
106. A thread is formed by cutting a uniform spiral ..... (6) around a cylinder.
107. Indexing is the operation of dividing the circumference of a piece into ..... (5) parts.
108. Two gears running together are said to be in ..... (4).
109. Brass and cast iron are milled ..... (3).
110. Machining metal parts accurately to

regular and irregular shapes, to cut gears, to groove taps, reamers and drills with rotary cutters is called ..... (7).

Perfect Score 25 Student's Score.....

KEY

86. scale	95. coarse	104. unsafe
87. working	96. damage	105. external
88. metal	97. center	106. groove
89. frame	98. center	107. equal
90. purple	99. steel	108. mesh
91. flutes	100. threading	109. dry
92. kerosene	101. left	110. milling
93. revolve	102. lathe	
94. plug	103. power	

TWO TESTS ON D.C. MACHINES

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Two Types of Tests. In the process of learning the pupil should study until *mastery* is acquired. However, the *type of mastery* needed is determined by the future use the pupil will have for that material. For example, it may be desirable that a pupil studying d.c. machines from a vocational standpoint be able to *recall* various points about the machines; and at the same time it may be desirable that a pupil studying the same topic from an industrial-arts standpoint be able to pass a *recognition* test only. Also, the type of mastery required by any pupil may change as the topic is being taught; a preliminary test may ask for recognition, while a final test on the work may require recall. The type of mastery test given should be determined by the objective of the individual pupil at the particular time the test is given.

Two forms of a test on d.c. machines follow: the first is a recognition type test (best answer), where the pupil must only *recognize* the correct answer, and the second is a recall test on the same material, where the pupil must *recall* the answer and insert it.

Answer Sheet. In order to conserve material and labor in getting the tests ready, and to save labor in correcting them, a scheme is presented whereby the pupil will place the answers on a separate answer sheet. The question sheets can be used over and over again since nothing at all will be written on them. When the answers are written on the standard form provided by the teacher much of the teacher's time can be saved when the papers are corrected since the answers can be quickly checked by the use of a master copy laid alongside the pupil's answer sheet.

A standard form of answer sheet may be used for various tests throughout the course. A sheet containing 50 numbered blank spaces (on half a large sheet of paper) and one containing 100 numbered blank spaces (on a full sheet of paper) will cover most possibilities. The tests themselves need not have exactly 50 or 100 questions, since only as many blanks are used as are needed.

If standard answer blanks have not been made up in advance the pupils may improvise them on any lined paper as they take the test; a standardized procedure should be used on any improvised form so that the teacher's key will match the pupils' paper in order to facilitate checking off the answers.

Best Answer Test

Directions: Several possible answers (marked A, B, C, etc.) are given for each question. Select the *best answer* to each question and place its letter (such as A, B, C, etc.) on the answer sheet in its proper space.

1. Magnetic lines of force *leave* the magnet at the ..... pole.
   A. North B. South C. either D. both
2. Magnetic lines of force flow through the air and *into* the ..... pole.
   A. North B. South C. either D. both
3. The space around a magnet that is filled with magnetic lines of force is called a .....
   A. magnet B. magnetic field C. residual magnetism D. permeability
4. What is the difference in the construction of a simple d.c. motor and a simple d.c. generator?
   A. The motor has more field coils B. The motor has less field coils C. The motor is smaller D. There is no difference.
5. In the d.c. machines that we have studied, the field is the part that .....
   A. rotates B. is stationary C. cuts magnetic lines of force
6. The duty of a generator is to produce ..... (Select the *best* and *most accurate* answer.)
   A. current B. electricity C. voltage D. magnetism E. resistance
7. In a generator, the lines of force come out of one pole, cross a/an ..... and go into the armature, cross another ..... and enter the other pole.
   A. north pole B. south pole C. field D. frame E. air gap F. winding
8. (Continuing from question No. 7.) The return path is through the .....
   A. north pole B. south pole C. field D. frame E. air gap F. winding
9. The voltage in the windings of a d.c. generator is .....
   A. a.c. B. d.c.
10. The voltage in the outside circuit is d.c. because the commutator acts as a ..... switch.
    A. automatic B. reversing C. two pole
11. The shunt field coils of a generator are made of ..... wire.
    A. large B. small C. iron
12. The shunt field coils of a generator have ..... turns of wire.
    A. many B. few
13. The purpose of a field of a generator is to produce .....
    A. motion B. magnetic lines of force C. electricity
14. In order to control the voltage delivered by a shunt generator, a rheostat should be placed in series with the .....
    A. armature B. field C. entire generator
15. To reverse the direction of rotation of any d.c. motor, it is best to reverse the .....
    A. line wires B. armature leads C. field leads D. armature E. field
16. When the load on a shunt motor changes, the ..... remains the same.
    A. torque B. current C. speed
17. In a series motor, the starting torque is .....
    A. high B. low C. medium
18. As the load on a series motor increases, the ..... decreases.
    A. torque B. current C. speed
19. When a d.c. generator does not get its field current from an outside source, it is said to be ..... excited.
    A. self B. separately C. very
20. The amount of voltage produced by a generator depends (to some extent) upon the ..... of wire in the field.
    A. size B. number of turns C. kind D. turns
21. The voltage produced in a generator does *not* depend on .....
    A. speed B. angle of cutting C. strength of field D. size of load E. number of conductors
22. The resistance of a ..... field is low.
    A. series B. shunt C. expensive D. magnetized
23. When a generator is first started, the armature conductors are revolving in a very weak field which is due to .....
    A. residual magnetism B. voltage C. current D. d.c. source
24. If the voltage of a shunt generator is too high, it can be lowered by several means; however, it *cannot* be lowered by .....
    A. increasing the resistance of the shunt field circuit B. increasing the speed C. increasing the load
25. Commutating poles are not used to generate voltage in the armature but are used to keep the .....
    A. voltage constant B. current constant C. speed constant D. brushes from sparking E. generator running
26. The coils on the commutating poles are in series with the .....
    A. armature B. shunt field C. entire machine D. poles
27. The voltage which is forcing a current through the rotating armature of a motor is the .....
    A. line voltage B. back voltage C. line voltage minus the back voltage D. C.E.M.F.
28. When the armature is standing still there is ..... back voltage.
    A. no B. very little C. very much
29. An excellent feature of the series motor is .....
    A. constant speed at all loads B. a possibility of controlling speed C. high torque at heavy loads
30. In order to control the speed of a shunt motor, a rheostat should be placed in series with the .....
    A. armature B. field C. entire motor
31. In a shunt motor, when the field strength is weakened, the .....
    A. speed increases B. speed decreases C. voltage increases
32. The "no-field" release is a device for shutting off all the power from a motor as soon as the ..... circuit is broken.
    A. armature B. shunt field C. series field D. complete
33. In starting a d.c. motor, a resistance must be placed in series with the .....
    A. armature B. shunt field C. entire machine D. poles
34. The strength of commutating poles depends upon the strength of the .....
    A. armature B. shunt field C. entire machine D. poles
35. *Caution:* never pull (disconnect) the field of a ..... motor.
    A. series B. shunt C. compound (long shunt) D. compound (short shunt)
36. *Caution:* never start an unloaded ..... motor.
    A. series B. shunt C. compound (long shunt) D. compound (short shunt)
37. *Caution:* never remove all the load from a ..... motor while it is running.
    A. series B. shunt C. compound (long shunt) D. compound (short shunt)
38. *Caution:* always stop a motor by pulling the .....
    A. rheostat arm B. main switch C. holding coil D. shunt field

KEY

1. A	4. D	7. E	10. B	13. B
2. B	5. B	8. D	11. B	14. B
3. B	6. C	9. A	12. A	15. B

16.	C	21.	D	26.	A	31.	A	36.	A
17.	A	22.	A	27.	B	32.	B	37.	A
18.	C	23.	A	28.	A	33.	A	38.	B
19.	A	24.	B	29.	C	34.	A		
20.	B	25.	D	30.	B	35.	B		

Completion Test

Directions: Place the answers to the following questions on the answer sheet. The answer may require one or more words.

In d.c. generators, the armature is the part that (1) ..... (does what?) and the field (2) ..... A generator is a machine that converts (3) ..... energy into (4) ..... energy.

The mechanical power required to rotate the armature at no load is very (small; large) (5) ..... The power required to rotate the armature at full load is very (6) .....

The duty of a generator is to produce (7) ..... (be careful of your answer — be exact). It does this by cutting the (8) ..... of a magnetic field. When the circuit is closed, the induced (9) ..... causes a (10) ..... to flow.

The lines of force (in a generator) come out of the (11) ..... pole, cross a/an (12) ..... into the armature, cross another (13) ....., and enter the other pole. The return path is through the (14) .....

Voltage is set up in any electrical conductor which is cutting a (15) ..... The amount of voltage set up depends upon the (16) ..... of wire, and the (17) ..... of the magnetic field, the (18) ..... of the (19) ....., and the angle of (20) ..... A *high* voltage may be produced by adjusting the following three things; by moving (21) ..... wires very (22) ..... across the faces of (23) ..... magnets.

When the field current for a generator comes from some outside source, the generator is said to be (24) ..... When the field is drawn from the generator itself, the generator is said to be (25) .....

In a shunt generator or motor (few, many) (26) ..... turns of (large, small) (27) ..... copper wire are used in the field. The resistance of these coils is, therefore (high, low) (28) ..... The necessary field strength of the field is obtained by the large (29) ..... which makes up for the small (30) .....

When a shunt generator is started, the armature conductors are revolving in a very weak field which is due to (31) .....

If a variable resistance is connected in series with the shunt field, the generated voltage can be controlled by changing the value of the resistance. If the voltage is too high it can be lowered by (32) ..... the resistance, which lowers the voltage across the field; this weakens the (33) ..... We can also *lower* the voltage by (34) ..... the speed of the armature.

Commutating poles are used to keep the (35) ..... from (36) ..... The coils on these poles are always in series with the (37) ....., so that their strength depends upon the (38) ..... current.

The armature of a motor has a very (39) ..... resistance. If placed across the full line voltage, a (40) ..... current would flow.

When the armature in a motor is revolving, its wires are cutting through a strong magnetic field and must, therefore, be setting up a (41) ..... This is always in the (42) ..... direction as compared with the current which is causing the motor to run. It is called (43) ..... The voltage that is forcing a current though the revolving armature is not the voltage of the line, but it is (44) ..... When the armature is standing still, there is (how much?) (45) .....

In a shunt motor, the weaker the field, the (46) ..... the speed will be.

The "no-field" release is a device for shutting off all the power from a motor as soon as the (47) ..... circuit is broken. If this release were not used, the magnetic field would be very much weakened, and only a little magnetism, due to (48) ..... would be left. When cutting these few lines of force, the armature would produce (much, little) (49) ..... back e.m.f. The effective (50) ..... would then send a (large, small) (51) ..... amount of current through the armature. This would make a very (52) ..... magnetic force in the armature and would speed up the armature. When the no-field release is used, if the field circuit is broken, the current through the (53) ..... is also shut off and the (54) ..... is released and thus the entire motor is shut off.

In starting a motor, a resistance should be placed in series with the (55) .....

To reverse the direction of rotation of a motor, reverse the (56) ..... connections.

Cautions: Never pull (disconnect) the field of a (57) ..... motor.
Never start an unloaded (58) ..... motor.
Never remove all the load from a (59) ..... motor while it is running.
Always stop a motor by pulling the (60) .....

KEY

1.	rotates (cuts lines) (produces a field)	32.	increasing
2.	stands still	33.	magnetic field
3.	mechanical	34.	reducing
4.	electrical	35.	brushes
5.	small	36.	sparking
6.	large	37.	armature
7.	voltage	38.	armature
8.	lines	39.	low
9.	voltage	40.	large (heavy)
10.	current	41.	voltage (emf)
11.	north	42.	opposite
12.	air gap	43.	back voltage (cemf)
13.	air gap	44.	the difference (effective voltage)
14.	frame	45.	none
15.	magnetic field	46.	faster (greater)
16.	number of turns	47.	field
17.	strength	48.	residual magnetism
18.	speed (armature)	49.	little
19.	cutting	50.	voltage
20.	cutting	51.	large
21.	many	52.	strong (large)
22.	rapidly	53.	holding coil (no field magnet)
23.	strong	54.	holding arm (handle) (arm)
24.	separately — excited	55.	armature
25.	self-excited	56.	armature
26.	many	57.	shunt
27.	small	58.	series
28.	high	59.	series
29.	number of turns	60.	main switch (knife switch)
30.	current		
31.	residual magnetism		

Problems and Projects

VICTORY SHOPPING CART

PAUL V. CHAMPION
Elwood, Ind.

During these trying times, when the winning of the war is the prime objective in the minds and desires of all Americans, the victory cart as shown and described in this article makes a very practical project for the shop class.

It makes a very convenient and useful cart or basket for the shopper who must transport her merchandise home from the stores. It has proved to be very popular in all of my classes.

The entire project can be made from salvage material, but for those who desire to use new material, yellow pine or any of the harder woods will be satisfactory.

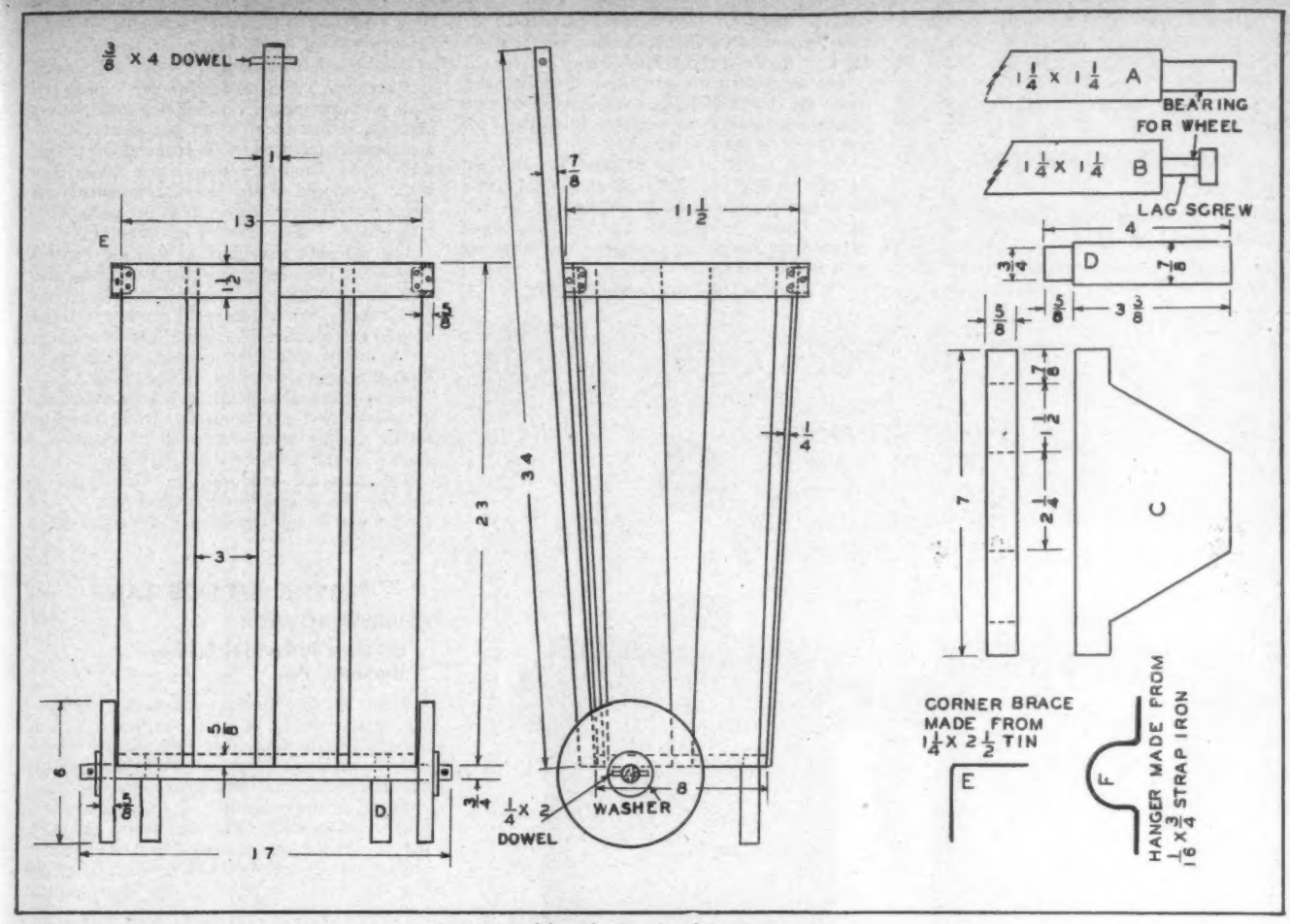
Two types of victory carts

With the use of salvage material found in crates, boxes, or pieces thrown into the scrap box, the cost of the material for the project can be entirely eliminated or cut to a minimum. This has its advantages now since much of our wood has gone to war.

Orange or lemon crates are always available from the local grocer or fruit dealer. They are inexpensive and may often be secured at no cost.

The best way to take apart boxes and crates is to saw the sides and bottom off just as close to the ends as possible. Then, by a rocking motion, the nails can be loosened in the partition enough to be drawn out with a hammer. The small pieces that remain under the nails at the ends may be broken away and these nails may be drawn. Care must be taken to see that all the nails are removed from the ends and partitions, and that no nails are broken off, leaving metal in the pieces to be used.

If this method of sawing the sides from the boxes is used, much more material can be saved than is possible when the sides are driven loose with a hammer. The latter method will split most of the boards into narrow useless pieces.



Assembly of victory shopping cart

Only a few inexpensive tools are needed to make the victory cart. This again adds to the saving of tools for those that find difficulty in securing the tools they need during the war emergency.

The sides of orange or lemon crates can be used for the sides of the cart; lemon crate ends are the correct length for the bottom and top side rails; and orange crate ends are the correct length for the top end rails.

The handle can be cut from ⅞-in. material found in the crates used in the shipment of heavy merchandise. It is often possible to find a narrow piece that has been cut from one edge of a board and thrown in the scrap box that will serve as a handle. An old broom handle also will make an excellent handle for the victory cart. The small dowel through the end of the handle is not necessary, but will aid the user in pulling the cart.

Wheels for the cart can often be found on discarded toys such as wagons, scooters, or tricycles. Wooden wheels are easily made from the ends of either orange or lemon crates or a very strong and durable wheel can be made by gluing two pieces of ⅜-in. thick material together with the grain at right angles to each other. Waterproof casein glue should be used because the wheel will probably be exposed to the rain and damp weather.

An axle from the discarded toys just mentioned, will often be suitable for the axle of the cart or one is easily made from an iron rod the correct diameter to fit the bearing in the wheel. A wooden axle is easily made from an old broom handle or a dowel rod as shown in the illustration. The wheels are held on the axle by using a large washer over the end of the axle and a ¼-in. dowel rod through the outer end of the axle to hold the wheel in place. The round axle can be fastened to the bottom of the cart by forming two pieces of strap iron to fit around the axle, as shown at F. These are then fastened over the axle and to the bottom with No. 10 by ¾ in. f.h. screws. Galvanized straps used for holding electric conduit in place also may be used to fasten the round axles on the cart.

Details A and B show how the axle may be made from 1¼ by 1¼-in. stock. Either of the two methods shown may be used. Those that have a hollow auger can cut a shoulder on the end of the axle to fit the bearing in the wheels. The 1¼ by 1¼-in. stock, if used for the axle shown at A, will have to be long enough to extend through the wheels and ½ in. beyond. In Detail B, the 1¼ by 1¼-in. stock is cut 14½ in. long, and a ⅜ by 4-in. lag screw is placed in each end for the bearings for the wheels. Fasten either of these axles to the bottom of the cart with two No. 10 by 1½-in. screws or two 3/16 by 2-in. stove bolts.

Cut the pieces for the bottom and the side rails to width. Nail the top rails together with 7d box nails. Fasten the sides to the top rails with No. 5 by ¾-in. f.h. screws, and to the bottom with No. 5 by 1-in. f.h. screws. These parts also can be fastened together with 2d box nails at the top and 4d box nails at the bottom. The 2d nails through the sides and the top rail should be well clinched with the grain.

Fasten the handle to the bottom with a No. 8 by 2-in. r.h. screw and to the top rail with a 3/16 by 2-in. stove bolt.

Reinforce the corners with angle irons, or with strips of 1¼ by 2½-in. tin, formed to fit around the corners and fastened to the rails with No. 4 by ½-in. r.h. screws with 2d common nails. See Detail E. If nails are used they should be well clinched on the inside.

If wooden wheels are used, cut a ½-in. rubber band from a discarded inner tube and tack it to the outside edge of the wheels, or a piece of garden hose may be split and fastened over the edge of the wheels. These are not necessary but will tend to diminish the rattle of the wooden wheels running over brick or stone streets and sidewalks.

Detail C and D give two plans for making feet for the victory cart. Detail D shows a shoulder cut on a ⅞-in. round to fit into a hole through the bottom. Two of these are necessary, one on each back corner of the bottom. Short pieces of dowel rods or pieces cut from a broom handle can be used for these parts. Detail C shows how a single piece may be fastened to the middle of the back edge with No. 8 by 1¼-in. f.h. screws. Material for the foot shown in Detail C can be found in either orange or lemon crate ends.

The half tone shows a victory cart made from a hamper used for the shipment of sweet potatoes. Hampers of this size and shape are used quite extensively for the shipment of fruits and vegetables, such as beans, peas, cabbage, tomatoes, and other kinds of produce.

A very practical and handy victory cart can be made in a short time by making a set of wheels, a handle, and a foot as described in

the foregoing, and fastening them to one of these hampers.

Finish the cart with two or three coats of a good outside paint in any desired color, and paint the wheels red, or give them a coat of aluminum paint.

CASTING CLASS PINS

RUFUS JACOBY

Calvin Coolidge High School
Washington, D. C.

The production of the Coolidge Colt pin is an example of how the school nickname can be used to motivate pupil activity and learning in metal crafts. The pin grew out of an idea suggested by the sports writers when they nicknamed our school the "Colts." We also felt the need to have pupils participate in creating and executing the designs for the casting unit in the metal-crafts course.

The art department produced the design and made the clay model. From the clay model two permanent patterns were cast in lead. The Colt pin is cast in sterling silver.

As the result of the demand for the pin by the faculty and students, the metal-crafts class has organized the production of the pin on a "mass production basis." They have planned the *routing* and assigned the following jobs *on the production line.*

1. Tending the furnace and pouring
2. Preparing the mold in sand
3. Cutting off sprue with hack saw
4. Filing rough edges
5. Buffing with tapered brush and crocus
6. Making pin stem
7. Soldering pin stem to head with soft solder
8. Polishing with rouge
9. Washing in hot soapy ammonia water
10. Checking finished pin

An excellent casting job

Two jewelers' flasks, 2½ by 3¾ inside measurement, are used. Jewelers' prepared sand produces sharp clean molds and perfect castings, if the metal is not overheated. Castings poured from overheated metal are rough and pitted, thus requiring much filing. The metal is poured at the lowest temperature at which it will flow freely. This produces castings which require little or no smoothing.

The students have built a melting furnace to produce the high temperatures necessary to melt silver. City gas is mixed with a stream of air under low pressure to produce a flame around the number 1 graphite lead crucible.

The black dead sand around the casting is discarded before breaking up the mold.

Since jewelers' findings cannot be purchased a satisfactory pin is made from 18-gauge round sterling wire, drawn to 20 gauge and shaped in the form of the safety pin.

The pins are produced in three types of finishes, the bright, oxidized, and cast.

The pin is sold through the Varsity Shop at $2 each.

PLASTIC BEDSIDE LAMP

ANDREW KOVACH

Hershey Industrial School
Hershey, Pa.

Many industrial-arts teachers are sponsoring limited units of work in thermoplastic materials as a means of developing a fundamental understanding of the thermoplastic materials which are becoming more and more common in everyday life. At present, quite a number of manufacturers are ready and willing to supply thermoplastic materials which are not up to specifications for industrial use but are very applicable for instructional purposes.

A clear methyl methacrylate plastic (Plexiglas or Lucite) was used for the bedside lamp. Limited amounts of this same material may be available in certain standard colors.

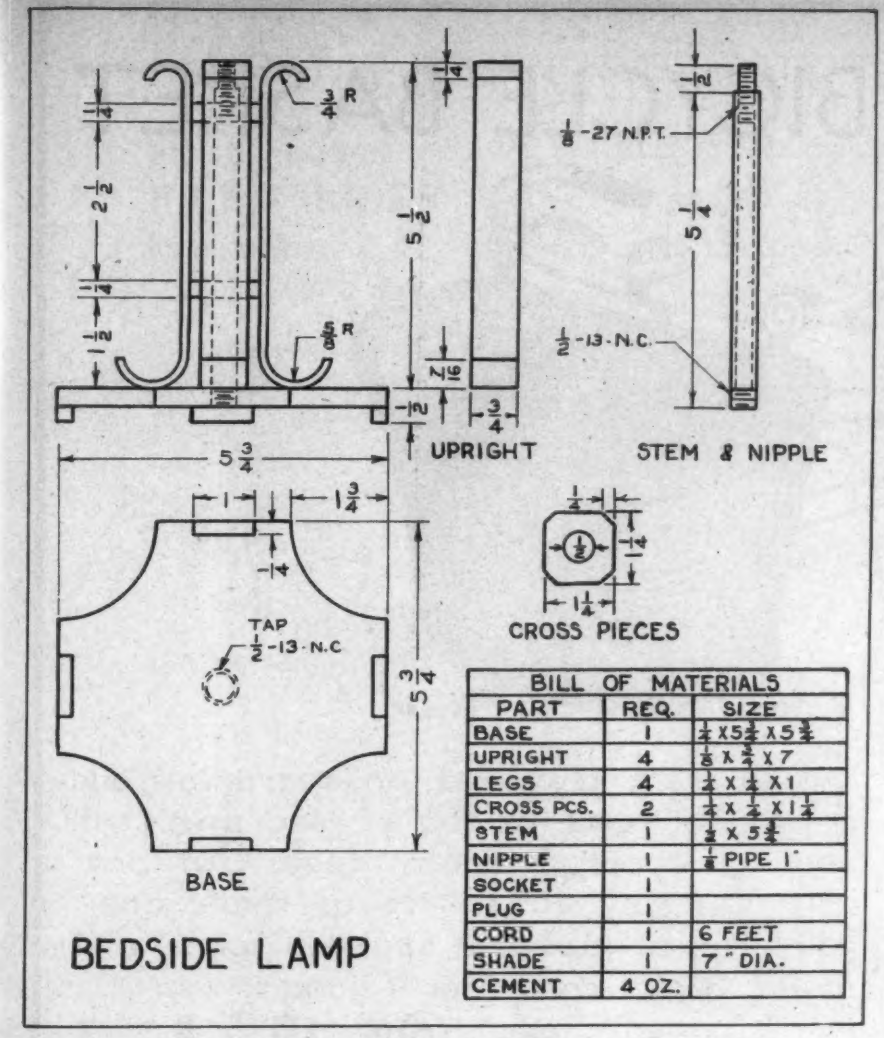
Ordinary woodworking tools are used for the majority of the operations on this material. All cutting can be done with a coping saw or with a fine tooth band saw.

The edges of the base are finished by filing, sanding, and finally buffing. Wet-or-dry sandpaper of 300 and 400 grit will be found to give best results. Plenty of water must be used during all sanding on the methyl methacrylate plastic. Sanding is continued until a very smooth surface is produced.

Buffing is accomplished through the use of firm felt wheels and loose cloth wheels. The initial buffing is intended to remove all traces of sanding scars. Tallow or any greasy lubricant is applied to the firm felt wheel to prevent the plastic from burning. A fine abrasive such as tripoli is applied to the wheel to aid in wearing away the slightly rough plastic surface that resulted from sanding. The plastic should be brought to bear against the buffing wheel very lightly to prevent overheating which will result in blistering the material. A higher polish is secured by following up the firm wheel buffing with a loose cloth buffer. In this case, use tallow without any abrasive. This tends to remove all traces of abrasive and produces a high polish. Finally, buff the plastic with a loose cloth wheel that is free of grease or abrasive.

The edges of all parts should be finished in the same manner. The flat surfaces should only require washing with kerosene to free them of grease or foreign matter.

The uprights are formed by heating the material in boiling water or in an oven and then



BILL OF MATERIALS		
PART	REQ.	SIZE
BASE	1	1/4 X 5 3/4 X 5 3/4
UPRIGHT	4	1/8 X 3/4 X 7
LEGS	4	1/4 X 1/4 X 1
CROSS PCS.	2	1/4 X 1/4 X 1 1/4
STEM	1	1/2 X 5 1/4
NIPPLE	1	1/8 PIPE 1"
SOCKET	1	
PLUG	1	
CORD	1	6 FEET
SHADE	1	7" DIA.
CEMENT	4 OZ.	

Plastic bedside lamp

shaping them over a form. Boiling water will be found most satisfactory for the beginner as insufficient heat is produced to damage the plastic. An open flame may be used if the material is passed over the flame in such a manner that it will become pliable without blistering. A satisfactory form can be made of 20-gauge galvanized iron. This form must be covered with billiard-table felt or some soft cloth material which will not leave scars on the softened plastic. Drape the softened plastic over the form and hold it in place with a soft cloth. Cooling takes place in a few minutes and the desired shape is retained. Undesirable scars on the plastic caused by forming or a poor forming job can be remedied by reheating the plastic and reshaping it. The plastic always returns to its original shape when heated to a temperature of 200 to 250 deg. F. In order to secure uniformity in the uprights, form a blank piece sufficiently large to cut all four pieces.

Both cross pieces are drilled to a diameter of ½ in. The hole is polished to permit the stem to pass through snugly.

The stem was made of chrome tubing and polished very highly. Any tubing which can be polished satisfactorily may be used. The inside diameter is sufficiently large to permit tapping to receive the nipple.

Various solvent cements may be used for fastening the parts. Ethylene dichloride, methylene dichloride, and glacial acetic acid produce excellent results. Shavings of the plastic produced by drilling or planing are added to the solvent to make a heavy cement. Of the three solvents mentioned, glacial acetic acid is the least desirable for school use as it has a tendency to blister the flesh of most people who handle it carelessly. Cemented joints are similar to a weld in that the surfaces flow together. No distinct break should be evident in a properly cemented joint. All adjoining surfaces are protected from the solvent cement by masking with a transparent cellulose tape or common masking tape. Cemented joints should not receive severe handling for at least one day.

The completed job is waxed to fill in any minute scars and to give a protective coating to the plastic. Waxed surfaces are very easily dusted. Refrain from using cleaning fluids on this material as many of them contain harmful solvents which are injurious to the surface.

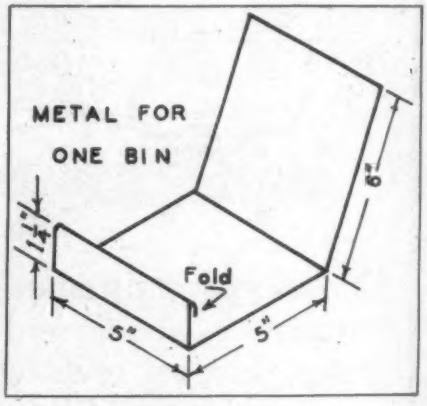
NAIL AND SCREW CABINET

ROY A. BARTHOLOMEW

Public Schools
Iowa City, Iowa

The illustration shows a container for nails and screws. It is a set of bins made out of used lumber and tin cans. The front, bottom, and back of each bin is made of sheet metal which is formed to shape on the bar folder or brake, then slipped into one-quarter inch deep saw kerfs in the vertical partitions. The vertical partitions are standard one-inch lumber about four or five inches wide. After all metal bins are slipped into place and nailed on front and back, the front of each partition is covered with a three-sixteenths inch thick facing board to improve the appearance. The entire case is painted a light color and each bin labeled by lettering with a ball-pointed pen and black drawing ink.

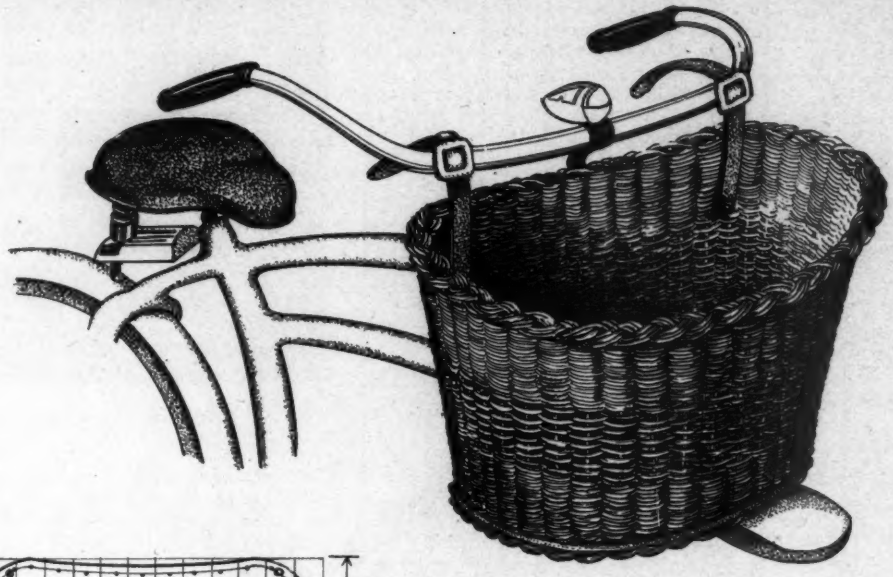
Nail and screw cabinet

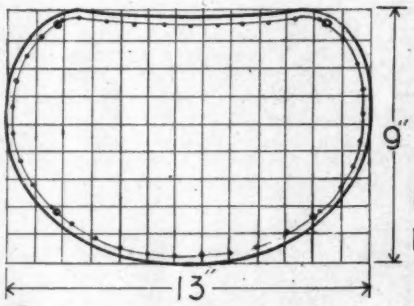


Liner for container

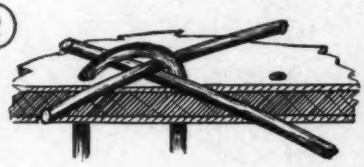
The case pictured was used in the school shop. Many others were made by the students for use in home work shops. For such use, the cases were often only three or four bins wide. Each bin was slightly smaller so that the metal for two bins could be cut from one number-ten tin can. The size of the bins may be adjusted to the size of the lumber and metal available. Each bin should be uniform in size, about 4 or 5 inches deep, 4 or 4½ inches high, and 4½ or 5 inches wide plus an allowance on the metal for the depth of the saw kerfs.

A REED BICYCLE BASKET





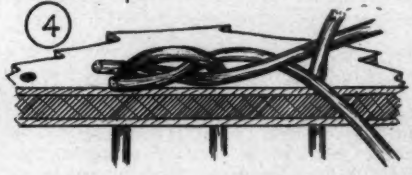
① In a $\frac{3}{8}$" plywood base drill an odd number of holes the size of reed used. Drill about 1" apart $\frac{1}{4}$" from edge. Cut one half as many 36" spokes as there are holes drilled plus one spoke 20" long. Cut four $\frac{1}{4}$" dowel rods 8" or 9" long.

② 

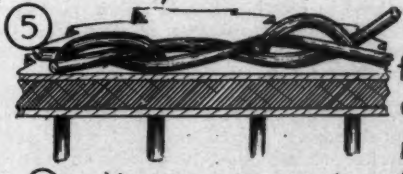
Draw ends of 36" spokes through two adjacent holes. Cross ends of weavers through loop.

③

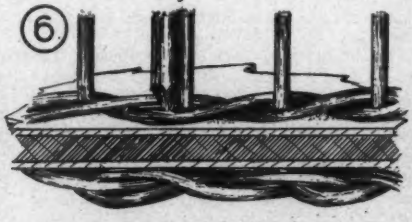
Pull down tightly over crossed ends. Have spokes of even length.

④ 

Insert a second 36" spoke into next hole to the right and draw half-way through.

⑤ 

Continue around base of basket, using double twist weave.

⑥ 

Turn right side up. Weave one row double twist. Insert dowel rod next to spokes at each corner for strength. Make walls of basket, using the various weaves as desired.

⑦ Finish the top with triple-strand braided edge.

Bicycle basket submitted by Louis V. Newkirk, director of industrial arts, Chicago, Ill.

HOW IS TYPOGRAPHIC UNITY ATTAINED?

Sic dicendum
JULIUS MODES
AT VERRIUS
1234567890

Caps, Lower Case, Small Caps,

1. By using type of one family or style. This does not preclude the use of an occasional contrasting line.

Sic dicendum
MODESTUS,
AT VERRIUS
2345678 90

and Italics of Same Family

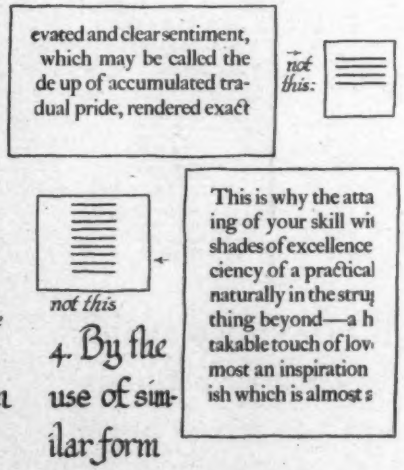
"Hypnerotomachia," Aldus, 1499

2. By tonal sympathy between type and illustration.

"Love Is Enough," William Morris, Kelmscott Press 1897

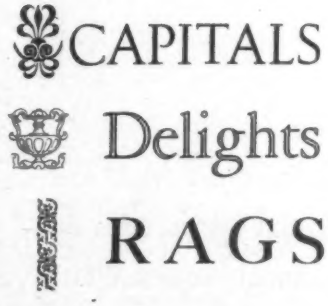
these *not these*

3. By agreement in detail and tone between type and border or ornament.


evated and clear sentiment, which may be called the de up of accumulated tra- dual pride, rendered exact
not this:
This is why the atta ing of your skill wit shades of excellence ciency of a practical naturally in the stru thing beyond—a h takable touch of lov most an inspiration ish which is almost

not this

4. By the use of similar form in type mass and paper.



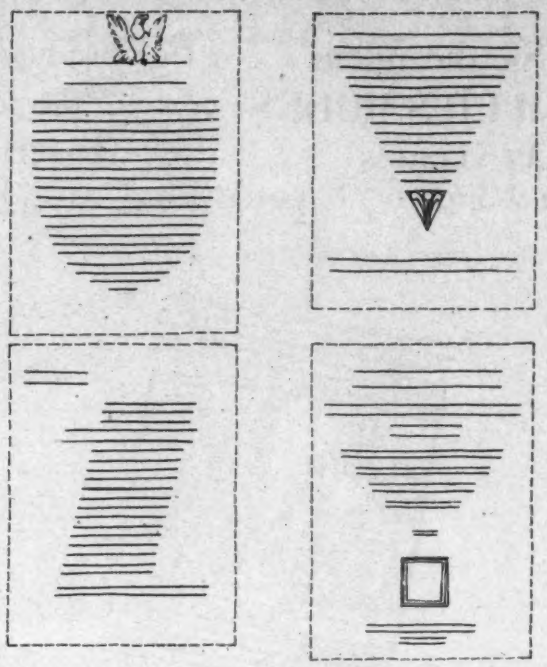
5. By historic correctness of type & ornament.

Plate 56. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

(TYPOGRAPHIC UNITY cont.)

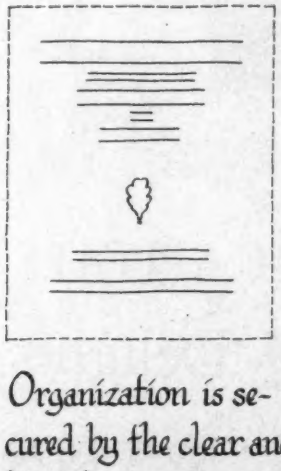
6. By the use of a symbolic ornament appropriate to the subject. The ornament may refer directly to the contents, or may only create an atmosphere.

7. By forming display material in simple and familiar shapes, usually geometric.

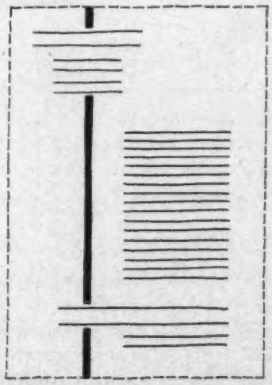


It is very easy to lose unity through forcing the type into naturalistic or elaborate shapes.

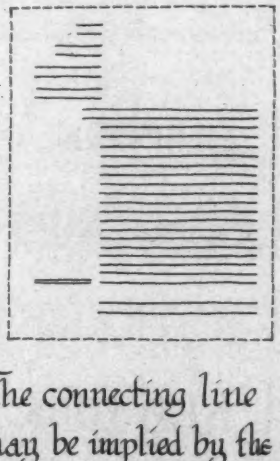
8. By logical arrangement and organization of material.



Organization is secured by the clear and logical sequence in the arrangement of text in display material.



The tie-up of separated parts may be obtained by a connecting line of rule or ornament.



The connecting line may be implied by the organization of elements to provide an alignment of an edge to lead the eye from part to part

Plate 57. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

A JOB SHEET ON A SIMPLE ELECTRIC MOTOR

LLOYD DECKER
Technical High School
Flint, Mich.
and
UNO SUOMELA
High School
Charlevoix, Mich.

With all the demands upon a teacher's time and attention, we hit upon this job sheet as a means of improving our instructional efficiency. With its detail drawings of progressive operations in making an electric motor, it gives the individual student more confidence in his ability to carry a job through on his own initiative. With this job sheet he is able to do a better job more quickly, since he has a step-by-step analysis and a pictorial drawing of each operation.

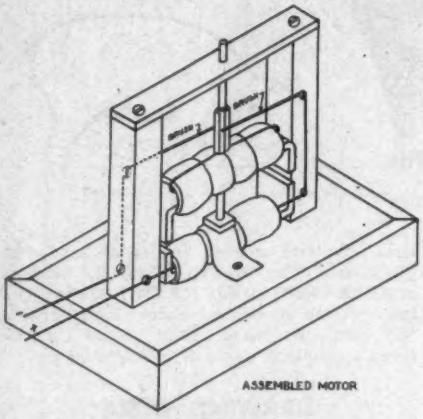


Fig. 1. The assembled motor

The job itself is one that is used in our general shop. This form of presentation also may be of help to general shop teachers as an aid in giving a good demonstration.

This type of instruction sheet has been used in the training of women workers for defense work in the war industries in this vicinity.

Method of Procedure

The Base

1. Cut out a suitable piece of wood.
2. Square it up to the dimensions shown in Figure 2.

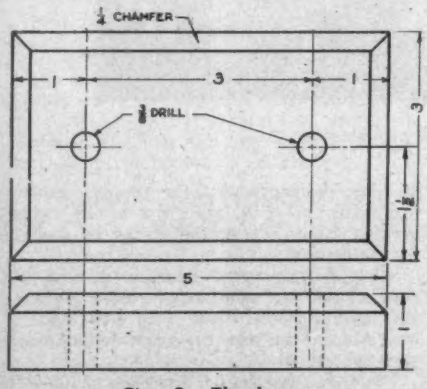


Fig. 2. The base

3. Cut the chamfer.
4. Lay out the holes.
5. Drill the holes.
6. Sand the base to a smooth surface.

The Uprights

1. Cut out a suitable piece of wood for two uprights.
2. Square up both pieces to the dimensions shown in Figure 3.

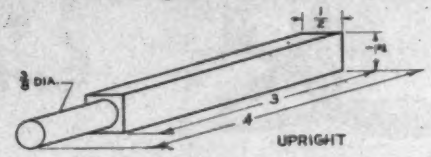


Fig. 3. Making the uprights

3. Round up the ends.

Assembling the Base and Uprights

1. Apply glue to the round ends of the uprights.
2. Glue the uprights into the holes in the base as shown in Figure 1.

Field and Armature Cores

1. Cut off 2 pieces of ⅛ by ¾ by 3½-in. strap iron.

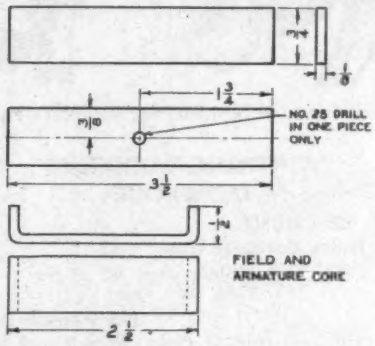


Fig. 4. Field and armature cores

2. File the ends smooth.
3. Drill a hole with a No. 25 drill into the center of one of the pieces. See Figure 4.
4. Bend up the ends of both pieces as shown in Figure 4.

Wiring the Field Coil

1. Wrap the field coil (the one without the center hole) with a layer of friction tape

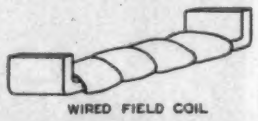


Fig. 5. The wired field coil

around the part between the turned up ends.

2. Wrap 3 layers of magnet wire over this tape.
3. Wrap a layer of friction tape over the magnet wire as shown in Figure 5.

Fastening Field Coil to Base

1. Cut a piece of galvanized sheet iron to the dimensions shown in Figure 6.
2. Solder a ⅜-in. square nut to the center as shown.
3. Form the strap to fit over the field coil, as shown in Figure 1, and fasten the field coil in place with screws.

Fig. 6. The field coil strap

Assembling Armature and Shaft

1. Cut head off a 10d nail.
2. Clean surface about hole on armature.

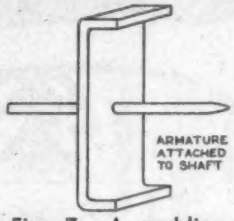


Fig. 7. Assembling armature and shaft

3. File nail bright around its center.
4. Force nail into hole as shown in Figure 7, and solder in place.

Wiring the Armature

1. Wrap the armature core with a layer of friction tape just as was done when wiring the field coil.

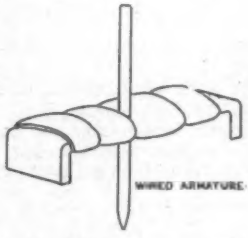


Fig. 8. The wired armature

2. Wrap 3 layers of No. 22 magnet wire over this tape.
3. Wrap a layer of friction tape over the magnet wire as shown in Figure 8.

Top Bearing Strap

1. Cut off a piece of ⅛ by ½ by 3½-in. strap iron.

Fig. 9. The top bearing strap

2. Drill the holes called for in Figure 9.

Commutator Segments

1. Cut out 2 pieces of ⅜ by ¾-in. copper as shown in Figure 10.

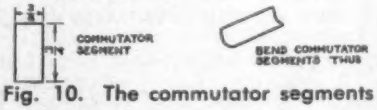


Fig. 10. The commutator segments

2. Bend them as shown.

Commutator and Armature Assembly

1. Wrap a piece of friction tape 3 in. long

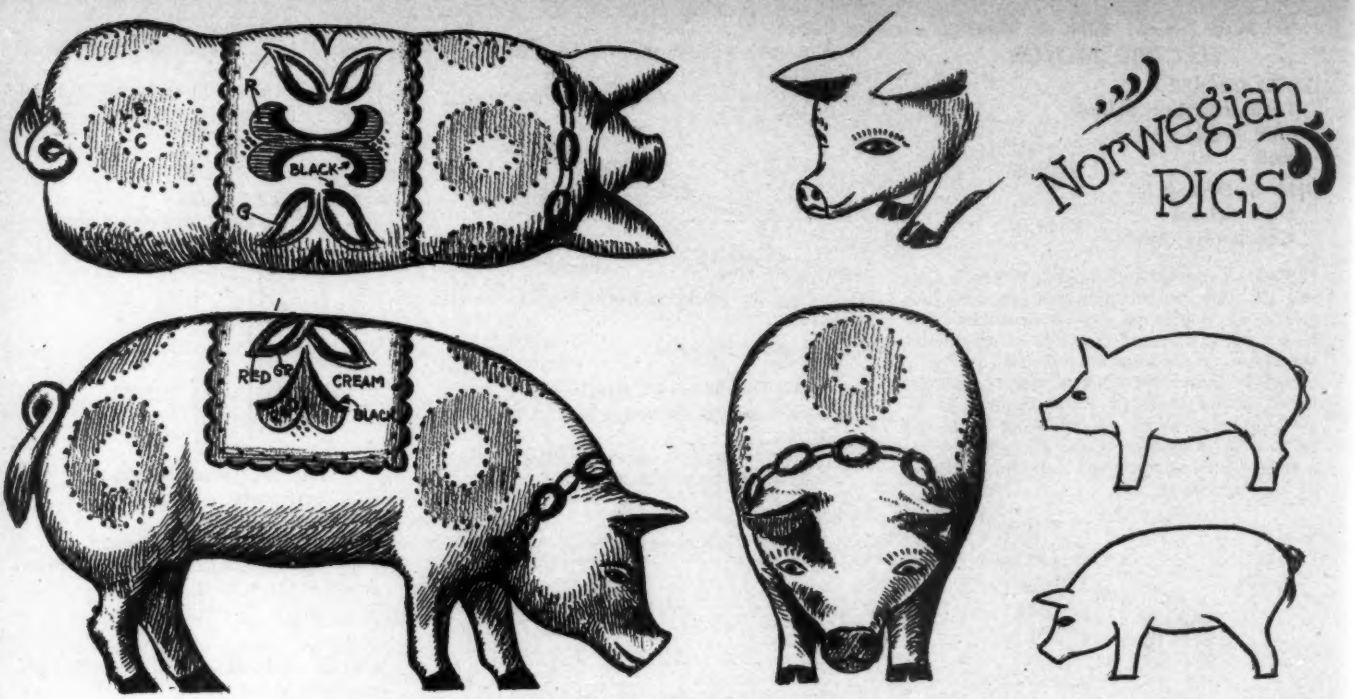


Fig. 175. Full-size patterns for the Norwegian pigs

around the commutator shaft as shown in Figure 11.

2. Solder ends of armature wires to the commutator segments.
3. Attach the commutator segments on top of the friction tape that has just been wound around the commutator shafts.

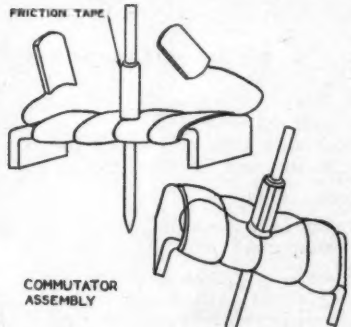


Fig. 11. The armature and commutator assembly

4. Fasten commutator segments in place with narrow bands of friction tape. See Figure 11.

Attaching the Brushes

1. Make the brushes out of two pieces of No. 18 bare copper wire.
2. Attach the brushes and wiring as shown in Figure 1.
3. Make the proper battery connection, and try out the motor.

Among the by-products produced in the cooking ovens of the steel mills are perfumes, nylon, vitamin pills, sulfa drugs, and numerous other seemingly unrelated articles.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN HUNT
Hales Corners, Wis.

(Continued from page 182 of the April, 1945, issue)

Norwegian Pigs

Who said "pigs is pigs?" Who would care to put an ordinary pig in a parlor. But when you scrub that pig to a pure white, place a wreath of roses around her neck and a pretty embroidered blanket on her back plus a few other spots of color, you have a pig that is a pig and you will gladly give her a place on the mantel shelf. You may even want to make room for a few little pigs besides.

To make such a group is very simple. A couple of evenings and you will have them all whittled, painted, and lacquered.

Whittled pigs of this particular type, I believe, are of Norwegian origin. After you have cut the silhouettes and whittled them, you can, if the knife cuts are nicely made, paint them as they are, or you can sandpaper them if you prefer. Give the entire pigs a good coat of white water color. The blanket is cream or light buff. The outer scallops are red, fading out as shown, with a black edging and dots. The floral design is red, black, and green. The oval spots on the sides and back are a very light blue with a cream center outlined with black dots. The wreath around the neck is made up of red circles for the roses and two green stems connecting them. Eyes, mouth, and hoofs are black. They should then be given a couple of coats of colorless lacquer.

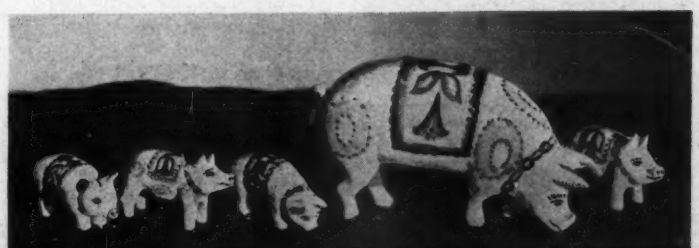


Fig. 176. The pig family

DRAWING TABLE

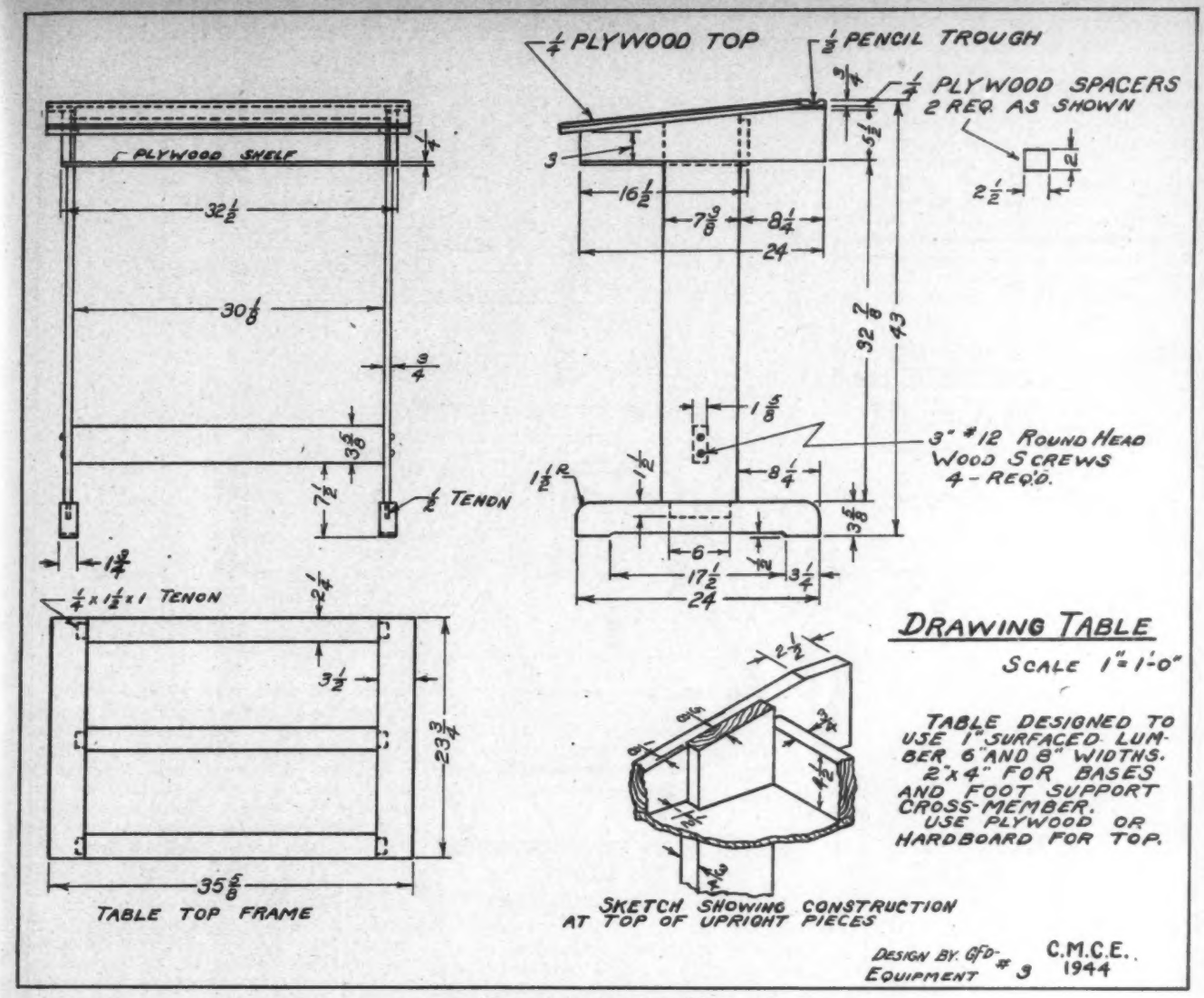
GEORGE F. DE PUY
Central Michigan College
Mt. Pleasant, Mich.

Seventy-five of the drawing tables shown here have been in use for over a year by navy V-12 trainees and have given very good service. The design permits the use of standard size stools and is the same size as our regular drawing tables so that both may be used in the same room.

Selected 1-in. surfaced lumber in 6-in. and 8-in. widths was used for the table supports and upright pieces, while 2 by 4-in. material was selected for the base and foot support cross pieces.

The frame for the table top was made with mortise-and-tenon joints and glued and nailed. The frame was then fastened to the side support pieces with 2-in. f.h. wood screws and the plywood or hardboard tops were fastened to it with glue and ¾-in. brads.

We have seen several of these tables built



Assembly and details of drafting table

according to this plan which did not use a mortise-and-tenon joint on the top frame. A butt joint using either scotch or corrugated fasteners with the top glued in place seems to give a rigid and satisfactory type of construction.

By carefully planning your selection of material very little waste will result. The table makes a good project for organizing a production line method in the school shop.

The kind of wood and finsh to be used may depend on wood available and the kind of finish on adjacent equipment. Hardwood should be used for the foot support piece as this will receive considerable wear.

SAFETY REMINDERS FOR WELDERS*

1. Avoid leakage of unburned acetylene. Do not leave a blowpipe unattended in a closed or poorly ventilated space.
2. Do not allow oxygen to saturate your clothes or to escape into the air.
3. Clean and purge any container that may have held inflammable substances thoroughly before welding or cutting on it.
4. Always provide a vent in any closed hollow parts before applying heat.

*Abstracted from "Oxy-Acetylene Tips," published by The Linde Air Products Co., 30 East 42nd St., New York 17, N. Y.

THAT FILING CABINET

JAMES MC GREGOR

Polytechnic Elementary and Junior High School
Pasadena, Calif.

The use of a filing cabinet eases the complexities of life in saving time, energy, and nerves. To be able to put your finger on a certain paper, clipping, or drawing in a moment instead of hunting for a half hour is like a shot of vitamin A. There is great need for more filing in home and in school.

This project also gives training in basic and time-tested cabinetmaking. Since no metal cabinets are available to the general public at present, it is well to make one, and thus conserve man power needed for the war.

This cabinet will, if built in workmanlike manner, last a lifetime. The only adverse thing about it is that it does not give the fire protection which a metal filing cabinet does.

Construction

Case: No special kind of wood is necessary except the few pieces of hardwood specified. These days it is a question of using what is on hand, or what can be bought or salvaged, and adapting the material to the job.

The sides of the case are a good place to start. These are simply frames of ¾-in. material with ¼-in. panels set into ¼ by ¼-in. grooves. Notches ¼ in. deep are cut in the styles or vertical ¾-in. pieces to receive the drawer slides, bottom frame, and middle rail. The top frame is rabbeted into the sides of the case, coming flush with the top edge of the top rail. The back is also rabbeted ¼ in. deep into the back edges of the case sides.

After making top and bottom frames fastened by ¼-in. tenons set in grooves, the sides of the case are ready for assembly with these top and bottom frames.

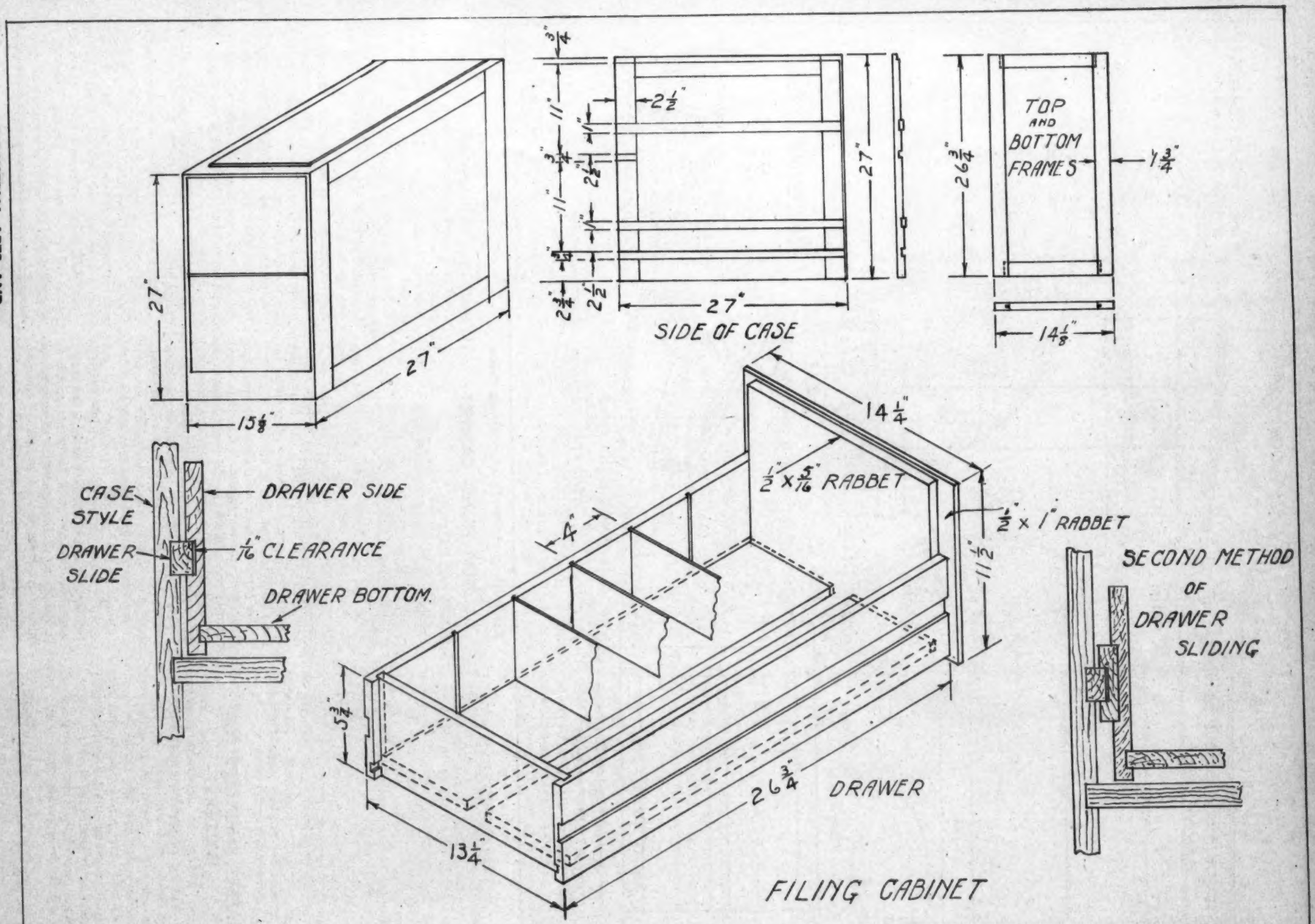
Glue blocks should be used inside case, between case sides and undersides of top frame, and between case sides and undersides of bottom frame. These blocks will not hinder the free sliding of the drawers.

Middle rail is next in order, and there is no frame here.

Bottom or baseboard rail is simply fitted in tight and glue blocked from behind.

Fire Drawers: These have been designed with lipped or rabbeted fronts. This is desirable to keep out dust, spiders, silver fish, etc.

The half height sides and backs reduce the weight of the drawers, making filing more accessible, and save material.



Filing cabinet submitted by James McGregor

Bill of Material for Two-Drawer Filing Cabinet

No. of Pcs.	Material		Size
	Sides of Case		
4	Pine		¾ x 2½ x 27 in. S4S
2	Pine		¾ x 2½ x 22½ in. S4S
2	Pine		¾ x 2¾ x 22½ in. S4S
2	Pine		¼ x 22½ x 22½ in. Panel
4	Hardwood		⅝ x 1 x 26¾ in. S4S
	Top and Bottom Frames		
4	Pine		¾ x 1¾ x 26¾ in. S4S
4	Pine		¾ x 1¾ x 11⅛ in. S4S
	Middle Front Rail		
1	Pine		¾ x 2½ x 14⅛ in. S4S
	Bottom Front Rail		
1	Pine		¾ x 2¾ x 13⅝ in. S4S
	Back		
1	Pine		¼ x 14⅛ x 26½ in. Panel
	Bottom		
1	Pine		¼ x 13½ x 25½ in. Panel
	Top		
1	Pine		¼ x 13⅜ x 26 in. Panel
	File Drawers		
2	Fronts	Pine	¾ x 11½ x 14¼ in. S4S
2	Backs	Pine	½ x 5¾ x 12¾ in. S4S
4	Sides	Hardwood	½ x 5¾ x 26¾ in. S4S
4	Bottoms	Pine	½ x 5¾ x 26¼ in. S4S
10	Divisions	Prestwood	⅛ x 4⅞ x 12⅝ in.
	Hardware		
2 — 5-in. metal or plastic handles			
2 — drawer locks (optional)			

Drawers hang on center slides. The bottom edges of sides are given clearances entirely free from their bottom edges. Particular attention is called to proper clearances round the center drawer slides, and also between the drawer sides and the sides of the case itself. Slides should fit not loosely but only with sufficient clearance to give smooth action. Hardwood slides and hardwood drawer sides will not only help to achieve smooth action, but will lengthen the life of the filing cabinet too.

Experience has shown that center sliding gives a better distribution of weight to a well-loaded filing drawer, than do regulation or conventional drawers resting and sliding on their side bottom edges.

Second method of drawer sliding: This has been added for those who may have difficulty in securing all hardwood sides for the drawers. It should be noted here that to use this method means making the case not 15⅛ in. wide but 15¾ in. wide. This is to take care of the additional pieces of hardwood set in the drawer sides. Although this method involves extra labor it has proved to be very satisfactory.

Practical Suggestions

Size: By this is meant the number of drawers, such as one-, two-, three-, or four-drawer filing cabinet, and this may be varied to suit the needs of the individual. Regardless of how many drawers you may decide to have, the size of each one will be the same in each case. This will hold letter size filing folders 9½ by 11¾ in., including the tab.

Table Top: If you plan to use a two-drawer cabinet, you may want to use it alongside of a table or flat-top desk. In that case, extra table space may be had by adding 3 in. to the height of the cabinet, making it a total height of 30 in. instead of 27 in. This extra 3 in. should be added on at the bottom.

Cut Cabinet: The depth of the cabinet may also be cut down to fit into some special place. Thus, for example, it may be cut down from 27 to 24 in. However, the 27-in. depth is the better size for all-round use.

Painting

For this, colors may be desired to fit some special surroundings or to match some piece of furniture. A dark olive green, but not too dull a color, will fit in very well in almost any type of surroundings. A base coat of shellac substitute or flat white will afford a good surface for a four-hour enamel.

WOODWORKING WITH ARSENAL LUMBER

BAYARD G. ODIORNE
Windham, Ohio

Since our sole supply of lumber is derived from the Ravenna Ordnance Plant, Ravenna, Ohio, some of our readers may be interested in learning the uses which we have made of this scrap lumber.

Empty shell cases are shipped into the arsenal, well packed in box cars with various types and sizes of crating material. After unloading the shells the lumber is run through nail-pulling machines, then cut into pieces not over 30 in. in length. Employees burn considerable quantities as kindling wood, and large amounts of the wood are burned in open bonfires. Our school has secured two large truckloads of this lumber, consisting of random widths and varieties of native hardwoods as well as some softwoods. Inasmuch as the school was to use the lumber for teaching purposes we received our boards in full 6-, 8-, and 10-ft. lengths. To date we have identified the following woods in our supply: beech, hard and soft maples, white and slippery elms, red and white oaks, sycamore, basswood, cherry, and large quantities of spruce and pine.

The projects for which such lumber are suited are limited because of the many nail holes, checks, knots and other defects present in most boards. We have found the wood suitable for building sleds, sleeve ironing boards, toys of various types, bread boards, and trellises. Three bicycle racks are being constructed for the school, much of the lumber being well suited for this purpose.

Since our equipment includes no planer, and the wood is received mostly in the rough, much hand planing must be done. Many pupils are acquiring considerable skill in planing.

Because of the wide variety of woods present, several pupils have expressed an interest in wood identification, and we have accordingly made a collection of specimens of several types of woods, including native, domestic, and foreign.

While the traditional patterns for teaching woodworking are not applicable with arsenal lumber, we have discovered that pupils have learned how to prepare a board from the rough, identify it, and select a plan for an article for which such wood is suited. We are enjoying our year of "scrap" woodworking!

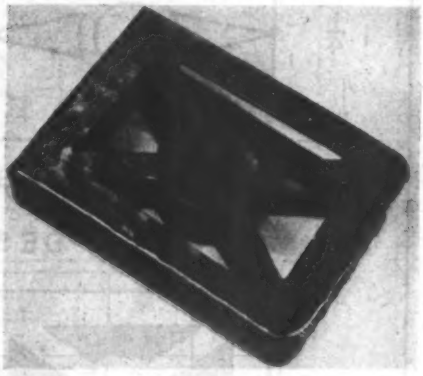
ORNAMENTAL TIN CRAFT

CHRIS H. GRONEMAN
Industrial Education Department
A. & M. College of Texas
College Station, Tex.

(Continued from page 186 of the April, 1945, issue)

Napkin Clip

The napkin ring shown in the illustration makes a pleasing accessory to accompany the dining room ensemble. The copperplated effect will blend beautifully with the usual accessories.



Napkin clip

The stock for this project should be built up to double thickness because it must retain its form and offer sufficient spring for holding the napkin. It is in many respects very similar in construction to the matchbox holder.

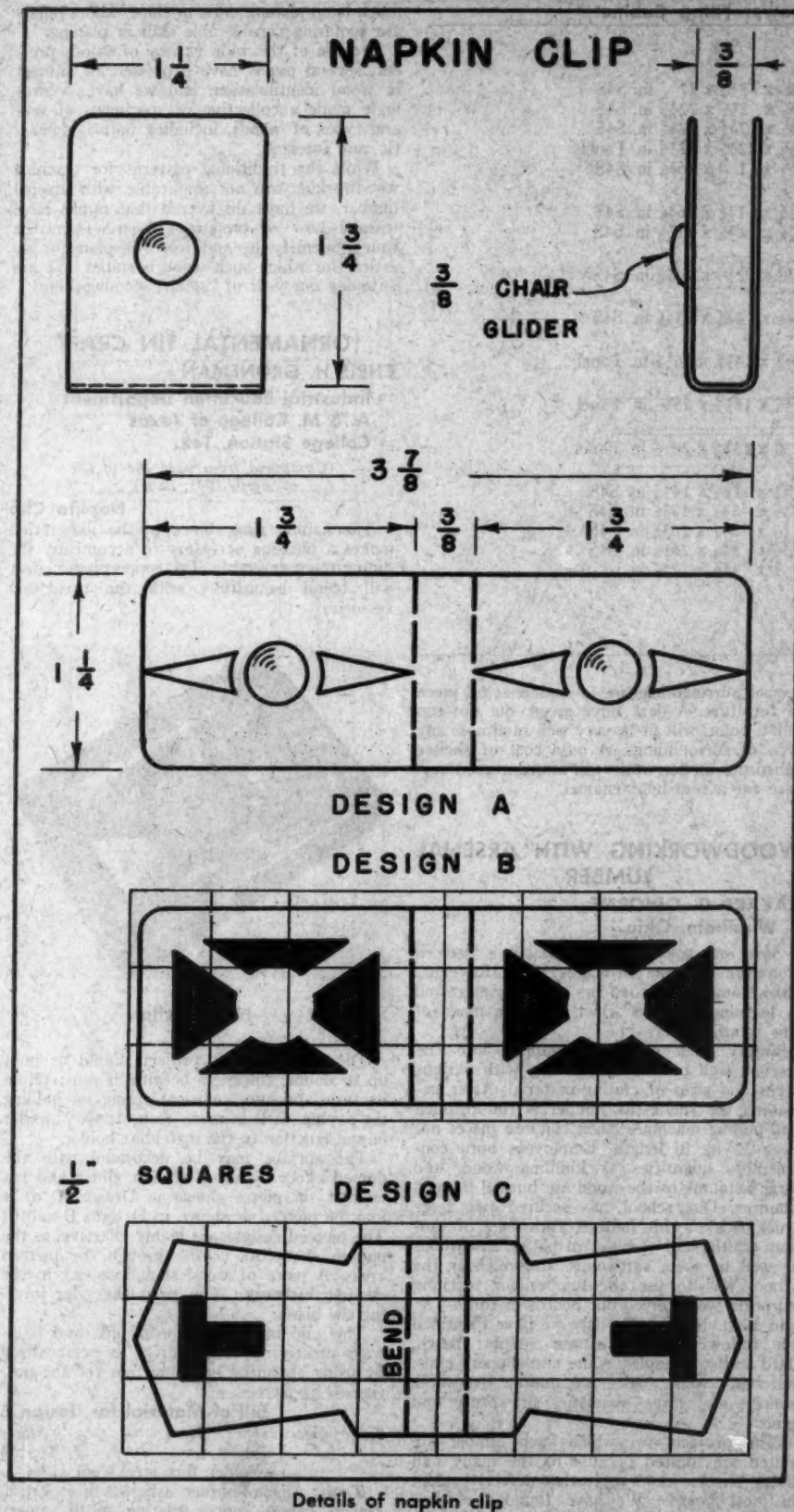
The surface may be decorated with the domed effect by using a chair glider and triangular tin pieces shown in Design A, or it may be pierced as shown in Designs B and C. The pierced designs are highly effective, as the napkin shows its colors through the pierced areas. A piece of wood should be cut to the desired thickness (⅜ in. or thicker) for forming the blank.

This clip makes an unusual gift and is always greatly appreciated if it is personalized by using an initial or monogram for the portion to be pierced.

Bill of Material for Design B

No. of pieces	Item	Size
2	Sheet tin	1½ x 4
	Solder, flux, steel wool	

Tools: Alcohol burner, asbestos sheet, brush, carbon paper, copper plating outfit, emery cloth, file, flat iron, heating device, jewelers' frame and blade, lead or wood block, lead weight, peening hammer, pencil, rule, scriber,



Details of napkin clip

soldering copper, tempera water color paint — yellow, and tin snips.

Procedure:

1. Use the design shown, or develop an original design.
2. Cut out 2 pieces of tin stock.
3. Solder one side of each piece.
4. Sweat both pieces together with hot flat iron. Weight the soldered parts together immediately as more is sweated.
5. Apply coat of yellow tempera water paint to one side of sweated piece for design transfer.
6. Lay design sheet and carbon paper over painted portion and trace design.
7. Cut out napkin clip with tin snips.
8. Drill holes and pierce.
9. File and dress edges with emery cloth.
10. Peen exposed surfaces on lead or wood block.
11. Bend napkin clip as shown.
12. Rub clip with steel wool and prepare for plating.
13. Apply thick coating of copper.
14. Polish project with steel wool. Hold metal with a cloth to prevent touching it with your hands.
15. Apply coat of clear metal lacquer and allow to dry.

PLACEMENT OF PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers should be placed where they are readily available and access to them is not likely to be cut off by fire.

When used to provide general protection for an area containing normal fire hazards, extinguishers should be so placed that at least one large or two small ones can be reached by traveling no more than 50 feet from any point in the area. Fewer extinguishers are required where the fire hazards are light, and more where they are severe.

When the extinguishers are used for safeguarding a specific fire hazard, they should be mounted near it, but not on or so close to the hazard that they will be involved if it catches fire. If the hazard is located in a relatively small room, it is good practice to mount the extinguishers either just inside or outside the doorways leading into the room. Operators can easily get at extinguishers so placed and have a safe line of retreat in case of necessity.

Extinguishers may be mounted on columns or walls, with hangers, brackets or shelves as supports. The tops of easily handled units should not be more than 5 feet from the floor; with heavy units, this distance should not exceed 3½ feet.

Extinguishers should be placed where they can be plainly seen. When they are wholly or partly concealed, their locations should be marked with conspicuous signs.

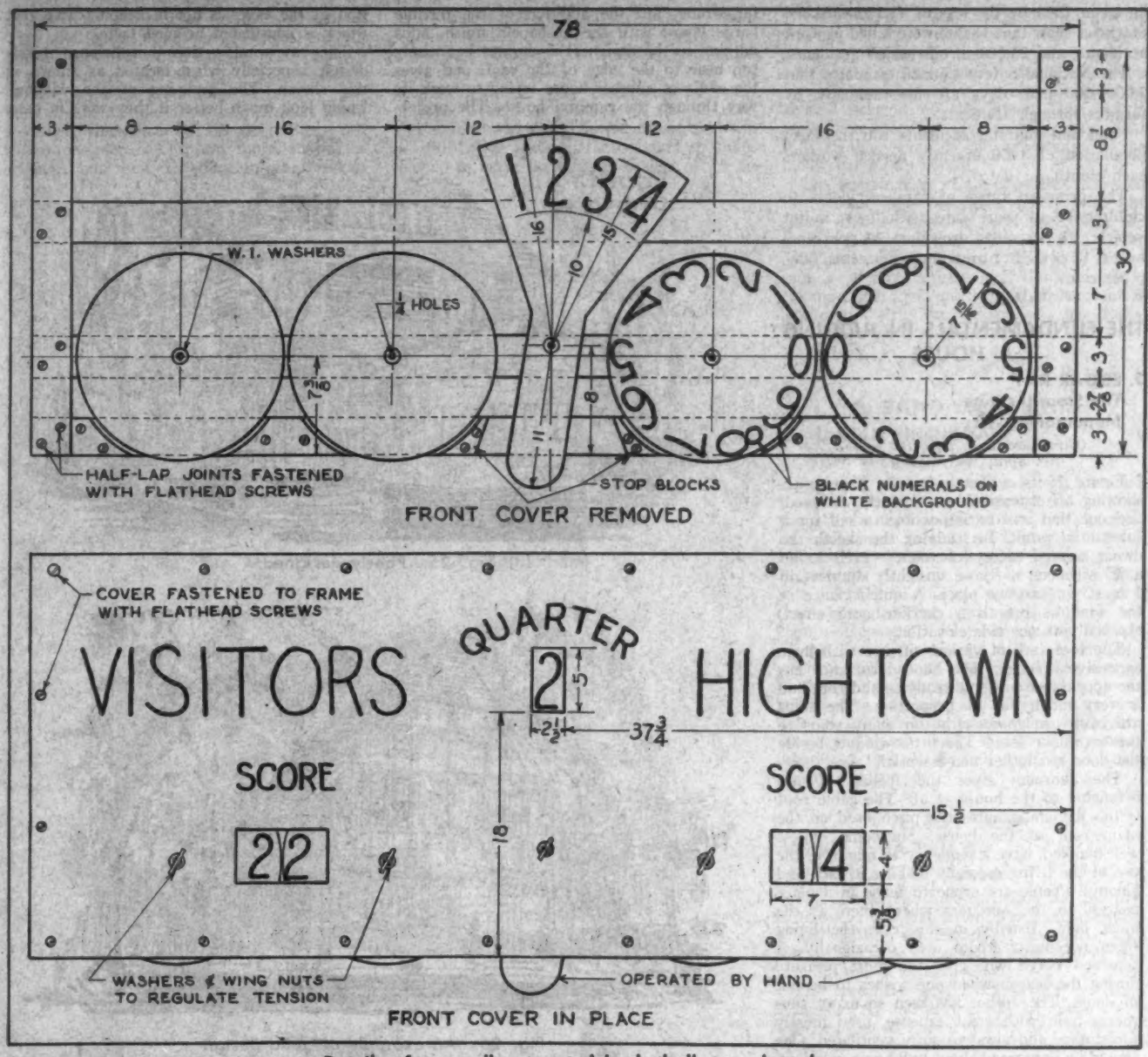
Nothing that might interfere with the accessibility of an extinguisher should be placed under or near it. All extinguisher locations should be checked at least once a day, and any obstructions found should be removed immediately.—Safety Research Institute, Inc., 420 Lexington Ave., New York 17, N. Y.

MANUALLY OPERATED BASKETBALL SCORE BOARD

GEORGE A. SMITH
Quarryville School District
Quarryville, Pa.

Here is a very practical basketball score board that can easily be made in the school shop. The score board contains only five moving parts, and it shows the quarter of the game as well as the score of each team. It is designed to be placed permanently against the gymnasium wall at a place where it can be conveniently operated by hand.

The frame is made of pieces of 2 by 3-in. white pine, or some similar softwood. The joints are half laps, and are fastened together with flathead wood screws. The five movable parts, and the cover can be made from ¼-in. plywood or composition board. The three lower



Details of manually operated basketball score board

backing pieces of the frame must be reduced in thickness to provide room for the moving parts. The lower piece of the frame should be built up between the moving parts with blocks of the right thickness to make a solid support for the lower edge of the cover. The movable parts are held in place with ¼-in. carriage bolts. The heads of the bolts are placed on the back of the frame. Place a large washer under the cover, and one on the front of each bolt, and add a wing nut so that the proper tension can easily be maintained. The washer under the cover will prevent the numerals on the disks from becoming marred by friction.

Paint all the numerals in black on a background of white in order to make them as readable as possible from a distance. Bevel slightly the windows for the numerals. Carefully lay out the lettering on the front cover to give the proper over-all balance. Paint the lettering in black. Several coats of clear varnish will add to the appearance of the finished score board. Fasten it securely to the gymnasium wall at a height conveniently reached by the operator.

SAFETY NOTES

The following items were taken out of *Safety News*, published by the National Safety Council, 20 North Wacker Drive, Chicago, Ill.

Forty-four times as many people between the ages of 5–19 died in the U. S. in 1942 from accidents as died from infantile paralysis.

One fourth of all pedestrians killed in urban accidents in 1943 were crossing at an unsignalized intersection — but one third were killed crossing *between* intersections.

More than half of all deaths from accidents in the home in 1944 occurred among persons 65 years and over.

More people were killed at home by burns than those killed in all railroad accidents last year.

A dashing young driver named Bill
Drove recklessly down a steep hill.
Said he: "I'm renowned
For covering ground."
But alas, now the ground covers Bill!

In 1943–44, one half of all accidents on the school playground occurred during unorganized play.

Two of every seven pedestrians killed in motor vehicle traffic accidents are 65 years or over.

Nationally, there was one fatal accident for every 372 families in 1944. One out of every three families had a disabling injury, and the cost per family averaged $139. A big toll to pay for carelessness.

Approximately 70,000 people suffered some permanent disability from work accidents in 1944.

In the 20 years from 1923 to 1943, the motor vehicle death rate for school age children (5 to 14 years) has dropped 38 per cent under the impact of organized safety effort in the schools.

The nation's productive capacity was re-

duced in 1944 by the loss of 41,500 workers. Statistics show that 18,000 were killed in work accidents, and 23,500 in off-the-job accidents.

The National Safety Council estimates that 25,000,000 man days are lost annually by farmers through accidents.

Fatal and nonfatal accidents rob the farm population of 1400 urgently needed workers each month.

The principal types of fatal accidents to children (5–14 years) are as follows: motor vehicle, 31 per cent; drowning, 24 per cent; burns, 12 per cent; firearms, 9 per cent; falls, 8 per cent.

THE FUNDAMENTALS IN JUDGING A HOUSE

J. EDGAR RAY
The Stout Institute
Menomonie, Wis.

(Continued from page 170 of the April, 1945, issue)

Figure 25 is a sketch from a photograph showing an expensive house poorly designed, and one that will be impossible to sell for a substantial profit. In studying the sketch the owner wanted plenty of room — even to an attic with one of those unsightly dormers in a most conspicuous place. A quick glance at the windows reveals a checker-board effect, especially on the side elevation.

The roofs are of various pitches with huge expensive brackets. The hooded entrance has the appearance of being ready to slide off, and is very much out of proportion. The steps are badly designed, with too many steps to the first floor level. The little window beside the door is another non-essential.

The sunroom gives the feeling of not belonging to the house at all. The gable roof is too flat and ignores the pitch used on the main roof of the house. Sunrooms, unless well handled, have a tendency to minimize the use of the living room by making it dark and gloomy. People are prone to settle in a place nearest to the outdoors where there is the most light. Usually in this case the living room becomes a room used occasionally. A screened porch will give the most pleasure during the season when one wishes to be out of doors. The author has seen so many sunrooms built with great expense, used mostly for storage and always poorly ventilated. One should be very wary about building a solarium, especially under the pressure of a building contractor who will try to sell you on the idea that it is a definite improvement. It is better to consult an architect.

Figure 26 is a sketch of an English half-timbered house that could be built for the same money used in building the house just described. Note the open porch, the pleasant grouping of windows and the modest but very appropriate entrance detail. The first floor level is about 10 to 12 in. above the grade level. The chimney has the typical English characteristics with its two ornamental chimney pots. The half-timber work is well handled. The only comment is, there is a feeling of too much timber work, but the house in general is decidedly much more pleasing and comfortable, showing a wise use of materials.

Figure 27 shows a Dutch colonial which has strayed far from what would be considered good design. The shape of the roof is not so far wrong, but the addition of the terrible barge board with the unshapely finish, adds nothing to the design. The dormer is entirely too near to the edge of the roof, and gives the effect of another house trying to work its way through the gambrel house. The projection of the eaves is not in keeping with that which is considered in good taste.

The bay window does not belong to this design, especially when located as shown in this sketch. The grouping of the windows would look much better if they were in pairs

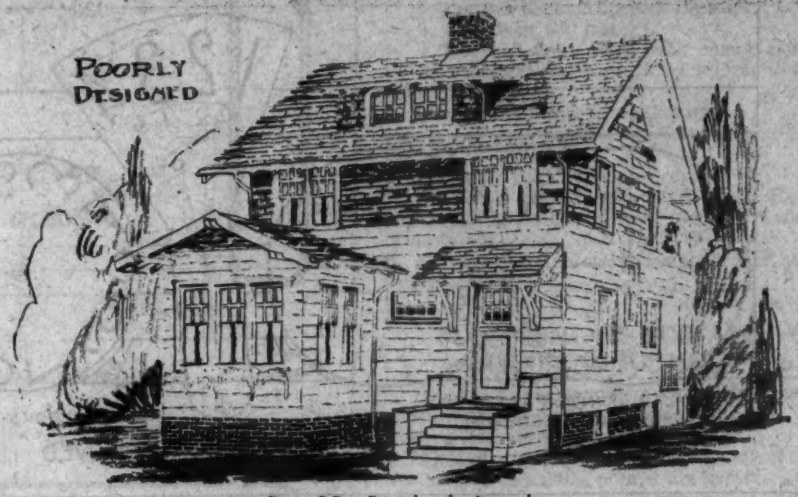


Fig. 25. Poorly designed

Fig. 26. An example of good design

Fig. 27. A poorly designed "Dutch Colonial" house

and nearer the center of the mass in general. The addition of the sunroom gives one the impression of an after thought. The entrance is not planned well, and the whole design is too far above the grade level.

In Figure 28 the sketch shows what might have been done with the design in Figure 27, if the designer had known more about the originals and how to work in the various details so they would harmonize with the completed design. The small dormers are in keeping with the general roof layout and are not obnoxious in the least. The addition of the gable annex gives the impression that it was planned well and fits in nicely with the main part of the house. The porch is cleverly worked out and is one that you can feel would function many days in the year. The design fits snugly to the ground and creates an effect of repose. There are many ways of designing this kind of a house, if the owner does not want such a combination as sketched in this design. Note the placing of windows with their shutters and the light columns supporting that part of the roof above.

Figure 29 shows a sketch of a most common type that was popular a few years ago. The general design is very poor with so many mistakes from the grade level to the roof, and anyone who has followed this article will not fail to see and feel the ordinary mistakes that go to make up a faulty design.

Fig. 28. A well designed "Dutch Colonial" home

Fig. 29. Another poorly designed house

Fig. 30. A well designed "Early American" home

The brick work in itself is perfectly alright, but the combination of brick and frame just don't fit. The wide elliptical arch adds little if anything to the design. The tapering brick piers remind one of heavy factory construction. The steps lead to a high floor level which prevents the house from having any degree of repose.

The wide overhanging cornice with its enormous brackets is surely not a thing of beauty. The dormer is brutally large, but it *is in keeping with the rest of the house*. The windows do not lend themselves to the exterior design whatever.

Figure 30 is a good design which gives a feeling of unity throughout. The windows seem to give one the impression that they are well placed and in perfect scale. The entrance is well designed and is in keeping with the general scheme of the layout. The porch, while large, does not give one the feeling that it is stealing some of the importance of the main part of the house.

The combination of the smooth surface on the second floor blends in nicely with the siding used on the first floor level. Note the small windows on one elevation with larger ones used on the gable end. The pitch of the roof is very appropriate and the large white chimney with its simple projection harmonizes admirably with the design of this Early American style of architecture.

(To be continued)

A BAND SAW KINK

G. HAROLD BILLINGHAM
Weehawken, N. J.

Paper of all types can be cut to size and shape on the band saw. Designs made of tissue paper to be used as decorations, for example, are easily made in mass production.

Draw the design on a piece of thin wood. Place paper to be cut in a pile under it, back with another thin piece of wood and fasten the whole together with nails, screws, or clamps keeping the fasteners on the outside of the design. Screws or nails can be used when the pile is not too high. When clamps of the spring clothespin type are used, blocks will need to be placed under the work to provide a firm base for the sawing operation. Blocks and clamps can be moved as the sawing progresses, to hold the unit together until the design is complete.

A TOY JEEP

ARTHUR L. BAGSHAW
Victoria, B. C., Canada

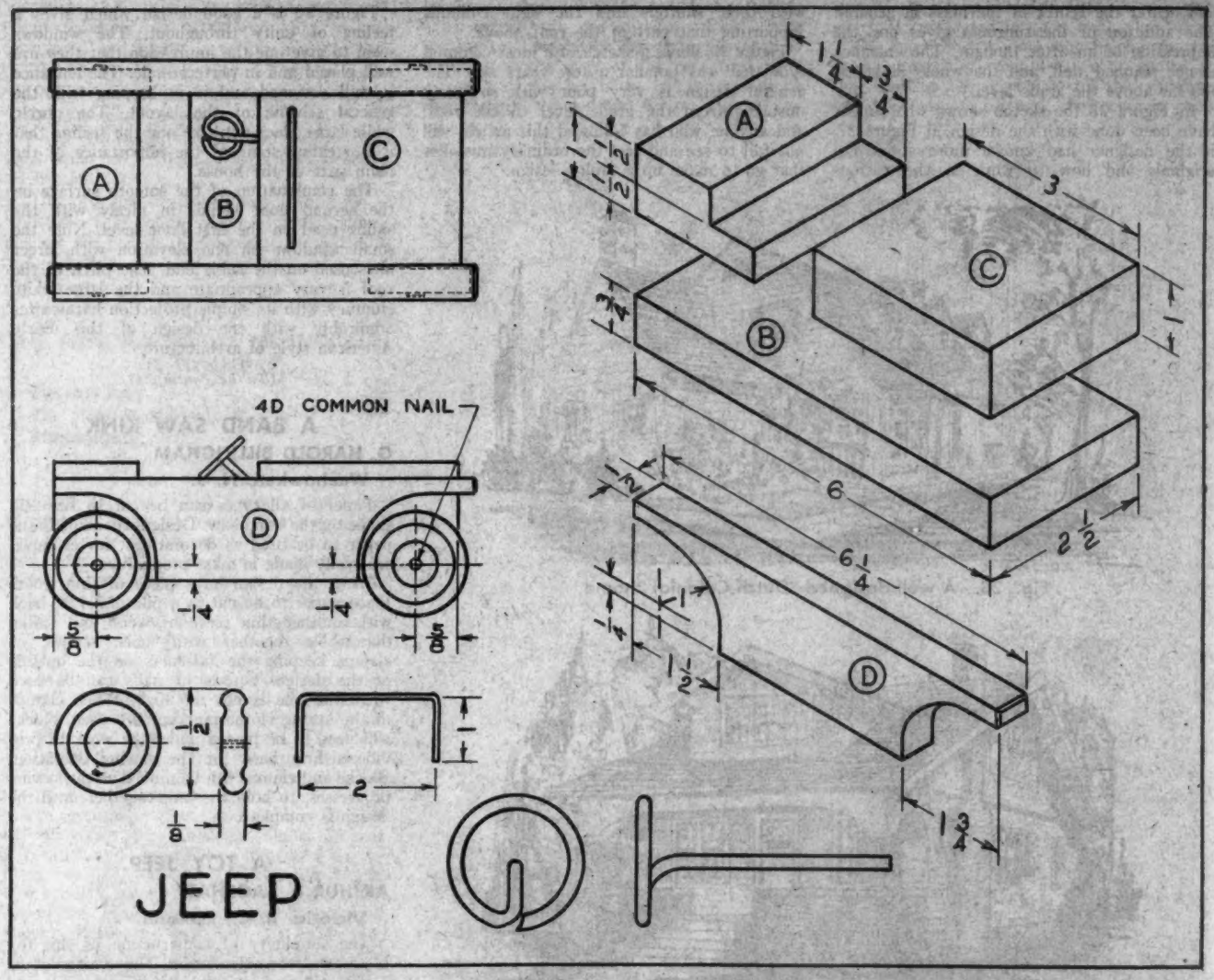
The simplicity of construction of this toy is its own recommendation. The average grade 7 boy will find no difficulty in making it and will at the same time get a good deal of enjoyment out of constructing it.

The base (B) is ¾ by 2½ by 6 in. long. The seat (A) and engine (C) are made from a piece of wood 1 by 2½ by 5 in. The seat is cut as shown in the diagram before the two pieces are separated. The piece remaining is the engine. Glue and nail all of these parts together as shown, being sure to nail from the bottom. Vertical lines may be cut on the front to represent a grille guard.

The sides forming the fenders (D) are cut from a piece of ½ by 1½ by 6¼-in. wood. The shape of the fender is cut with a coping saw after the curved lines have been put on with a compass. The long end is slightly chamfered to give the impression of a head lamp. The fenders are glued and fastened in place with 1-in. brads, being flush at the back of the jeep and extending ¼ in. to the front.

The wheels are made from a piece of 1½-in. round. Pieces ⅜ in. thick are cut off and held in a wood chuck on a lathe and turned to shape. If a lathe is not available simply sandpaper the edges round and give the effect of a tire in the painting. An extra wheel to be fastened on the back as a spare adds to the appearance of the jeep.

The axles for the wheels are 1½-in. common wire nails. Make sure to drill small holes



Details of toy jeep

for the nails or you are likely to split the wood. These holes are ¼ in. up from the bottom and ⅝ in. from the front and back.

Washers to go between the body and the wheels are made by holding a nail in a vise and winding around it a piece of 14-gauge galvanized wire. Holding the coil and nail in the vise with a hack saw, cut lengthwise of the coil. This will give separate turns for the washers.

The windshield is made by taking 4 in. of 12-gauge galvanized iron wire and at 1 in. from the ends making a 90-deg. bend.

The steering wheel can be made by bending a piece of 12-gauge wire around a ¾-in. round iron rod. Remove from rod and bend the wire across the center of the ring just made. Now bend the wire at 90 deg. to the ring as shown in the diagram, making sure the stem comes from the center of the ring. Now cut to length. A slot cut across the end of the rod helps considerably in holding the wire and in bending.

Give all wood parts a coat of flat white paint and allow to dry thoroughly. Sand lightly to remove all traces of excess filler with which the nail holes have been filled. This filling of holes should be done after the first coat of paint is dry. Give final coat of khaki enamel or whatever color one wishes.

A FEW SHOP KINKS

G. HAROLD BILLINGHAM
Weehawken, N. J.

Some types of coping saws have a loose piece on the top. When the blade is broken, there is the chance of losing the part.

We drilled a hole through the part and attached a wire, such as comes on milk bottle caps. The piece is still movable, but definitely attached, as shown in Figure 1.

In our general shop we have three engine lathes. In order to save student time, one of the machines is set up for chucks, collets, drill chucks, and other accessories. The tail stock is kept in the tool cage and a double shelf, made to fit the machine, is set in its place. The upper shelf is used only for precision tools, the lower section is for wrenches, tool holders, and the like. See Figure 2.

The surface gauge is provided with an eraser, to be placed on the unused point. This saves a good many "jabs," and also tends to protect the point. Micrometers are kept in eyeglass cases, which helps in maintaining good housekeeping.

Machines with movable tables do not operate easily when chips get into the threads which control the action. Damage may also be caused by these foreign substances.

Fig. 2. Hand tool holder. Ends protected on surface gauge. Glass case for micrometer

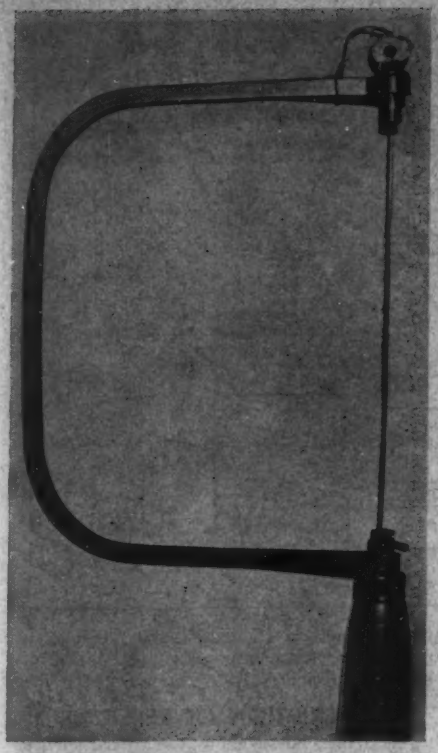


Fig. 1. Protection against loss of parts

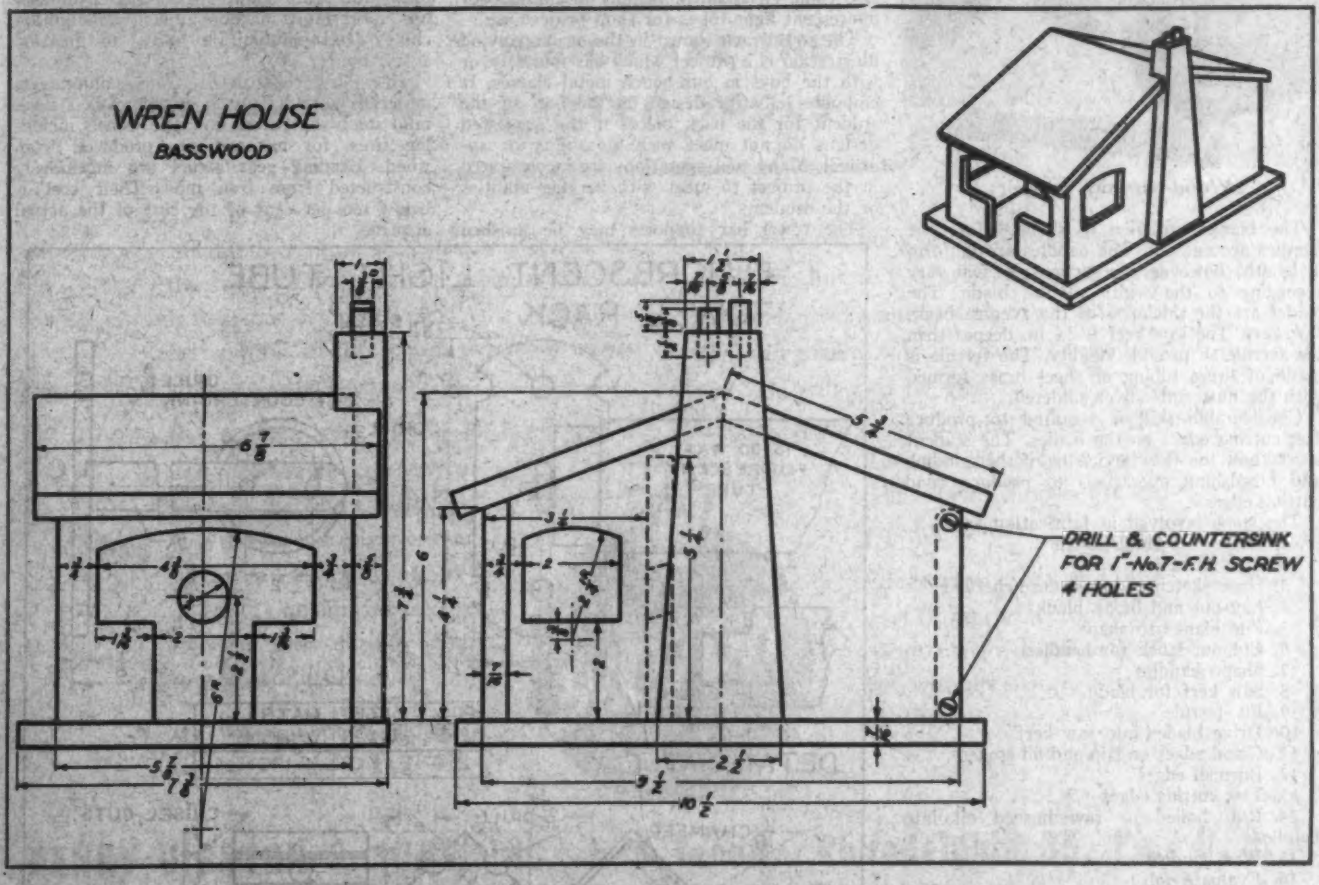
Fig. 3. A leather machine protector

To protect our milling machine, a piece of 9½ by 7-in. pliable leather was installed as shown at X in Figure 3. A metal piece was used as a holddown on the frame, by making use of two machine screws already in place. It was only necessary to drill and tap two holes in the cross slide, for the holddown on the other end.

This shield does not interfere with the machine operations in any way, and chips which collect on it can be removed easily. A paint brush is furnished to aid in the general cleanup.

A device of this sort installed on all new machines would save a lot of future wear and tear, and aid in the continuous built-in smooth operations of the unit.

Homer J. Smith says that *related subjects* are not really subjects but rather the *hows* and *whens* and *whys* of doing things.



Wren house designed by William E. Slaby, Detroit, Mich.

WOOD-CARVING SCRAPER

RUFUS JACOBY
Coolidge High School
Washington, D. C.

To the teacher and pupils, confronted with the scarcity of consumable supplies in the general industrial-arts shop, this job provides a variety of manipulative processes using scraps of lumber and worn-out carpenters' handsaw blades. The scrapers described herein may be used to finish carvings or models in the school shop, home workshop, or art department.

The shape of the blades may vary according to the ideas of the individual. However, the three suggested shapes have been found adequate and satisfactory. To cut blanks out of the blade, score the outline of the blank on one side of the blade with a triangular file. Fasten the blade in a vise with the scored line flush with the top edge of the vise. Tap the exposed blank with a mallet until the blank breaks off along the scored line. Precautions must be taken to prevent the blank from flying through the shop when it breaks off.

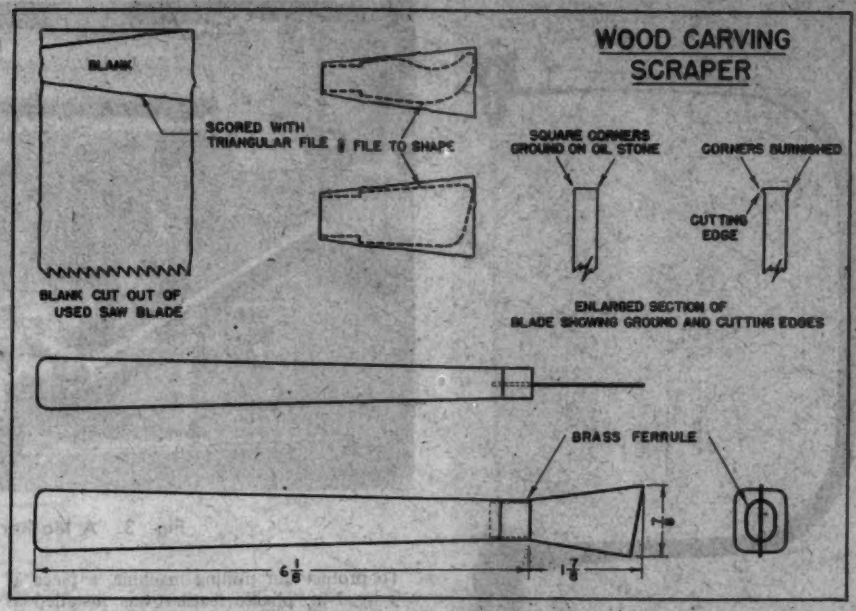
Wood-carving scraper

The blanks are filed to shape before the handles are cut out. The handles are uniform in length; however, the section size will vary according to the width of the blade. The blades are the thickness of the average backsaw kerf. The saw kerf is ¼ in. deeper than the ferrule to provide rigidity. The ferrule is made of brass tubing or sheet brass formed with the butt ends silver soldered.

Considerable skill is required to produce fast cutting edges on the blades. The student must know the *Why* and *How* of the grinding and burnishing operations to produce good cutting edges.

The steps involved in fabrication are:

1. Make free hand sketch
2. Plan procedure
3. Have sketch and procedure checked
4. Lay out and break blanks
5. File blanks to shape
6. Cut out stock for handles
7. Shape handles
8. Saw kerf for blade
9. Fit ferrule
10. Drive blades into saw kerf
11. Grind edges on slip and oil stones
12. Burnish edges
13. Test cutting edges
14. Rub boiled or raw linseed oil into handles
15. Wax handles
16. Evaluate job



FLUORESCENT LIGHT TUBE TOWEL RACK

C. H. SEBRANKE
Roosevelt Junior High School
Fond du Lac, Wis.

With the expanded use of fluorescent light in industry, business, and home, there has also come an abundant supply of burned out fluorescent light tubes for shop project use.

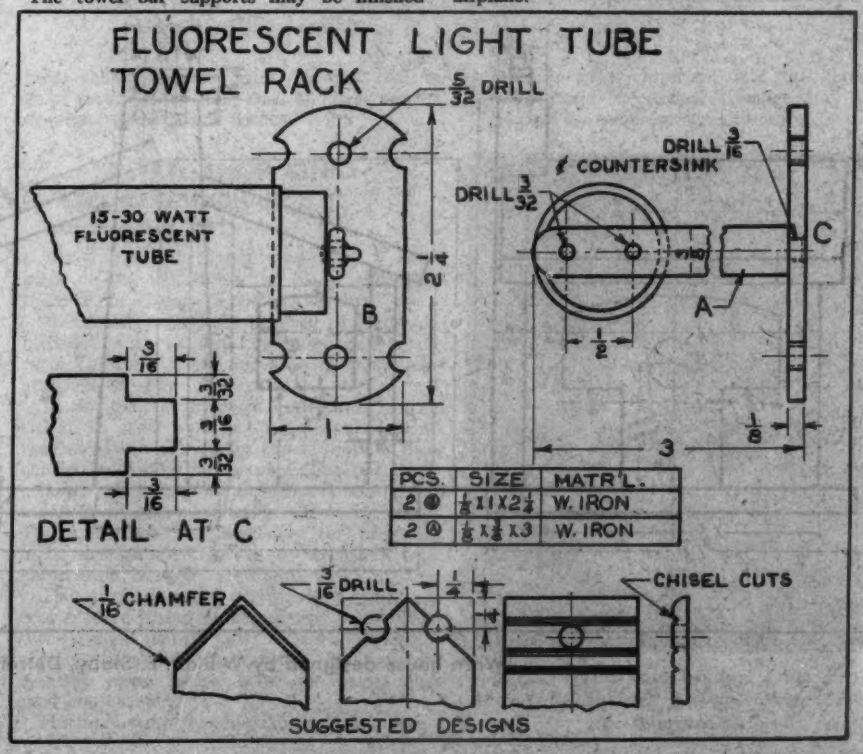
The towel rack shown in the accompanying illustration is a project which has found favor with the boys in our bench metal classes. It embodies creative design on the part of the student for the back pieces if the suggested designs do not meet with his ability or approval. Many tool operations are incorporated in the project to meet with varying abilities of the students.

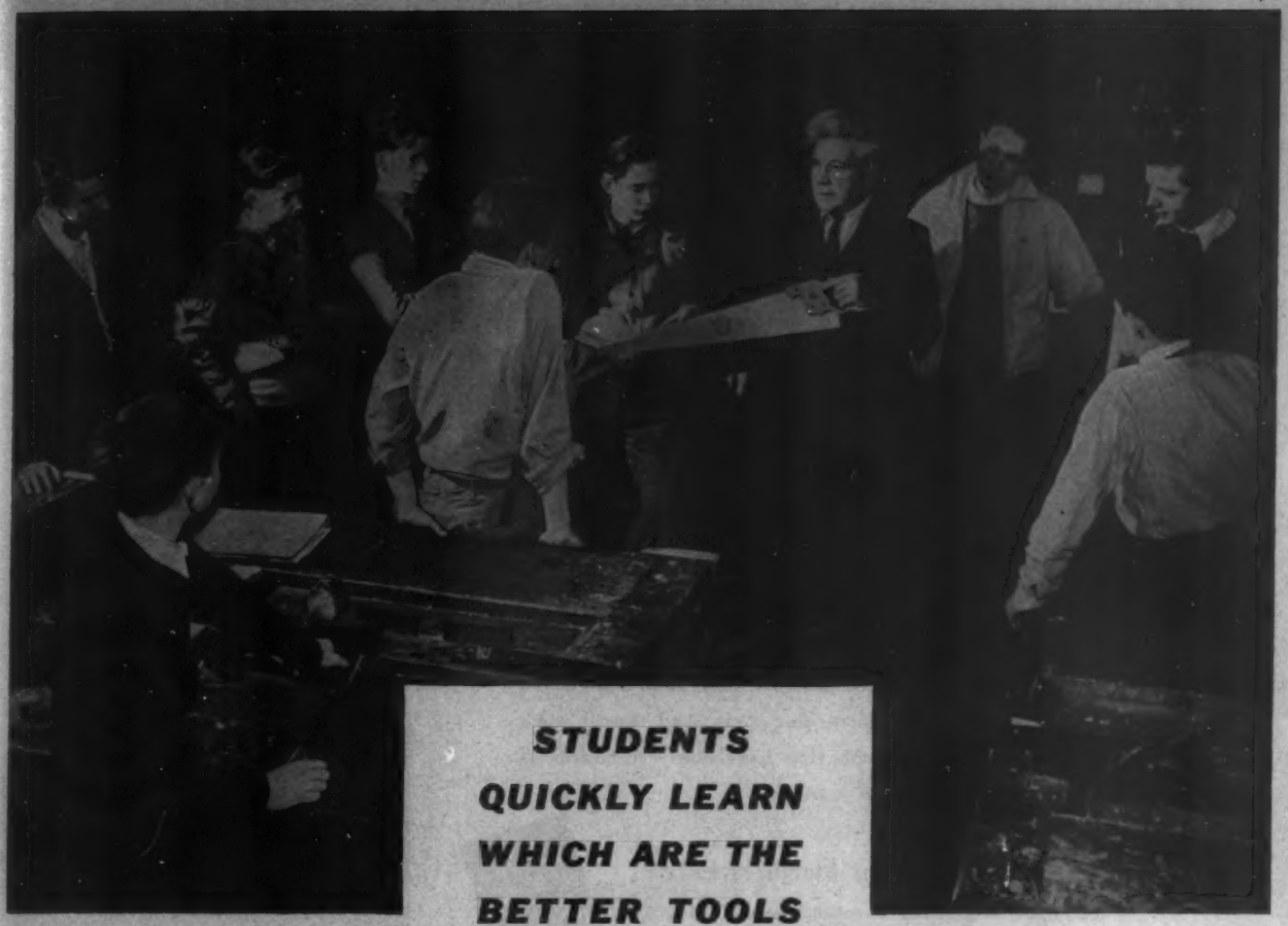
The towel bar supports may be finished with enamel, or the backs may be hammer marked and finished as ornamental iron projects are finished.

DESCRIPTION OF REPLICAS

The replicas designed by the Special Devices Division of the Navy were intended to meet specific problems of training. Each replica was completely equipped with gun sights, mounts for bomb sights, bomb racks, trunion mounting posts for machine guns, ammunition chutes, and ammunition boxes, to mention a few items.

They are constructed from nonstrategic materials such as plywood, cold rolled steel, mild steel, sheet iron, etc. The wheels including tires, for instance, are produced from wood. Landing gear struts are ingeniously constructed from iron pipe. Their cost is below ten per cent of the cost of the actual airplane.





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Association News

♦ On February 9 and 10, a two-day Industrial Education Conference was held at Indiana State Teachers College at Terre Haute, Ind., in cooperation with the Indiana State Department of Trades and Industry. The theme for the conference was "A Program of Action for Industrial Education."

Timely topics in industrial education were discussed by such outstanding men as Dr. Homer J. Smith, University of Minnesota, conference leader; Mr. M. D. Mobley, president of the American Vocational Association; and Major A. L. Edmonds, Army Service Forces, Fort Hayes, Columbus, Ohio.

General Sessions:

1. Friday morning (opening session): The conference theme was discussed from the viewpoint of industry by Mr. W. C. Christensen, Curtiss-Wright Corporation; of the schools by Superintendent A. T. Lindley, Crown Point, Ind.; and of the state by H. G. McComb, State Supervisor of Trades and Industrial Education.

2. Friday evening banquet: Dr. Smith spoke on the subject "Two Ways to Look at a School" stating that the *individual* must be considered by the teacher but that the *group* from which the individual comes must be the chief consideration of the administrator. Mr. Mobley outlined the trends that vocational education would have to take if our educational program is to serve adequately all the people.

3. Saturday noon luncheon: Major Edmonds presented a very graphic account of "G. I. Methods of Instruction" in which he stated frankly that there is no such thing as G. I. methods but that the army training program is utilizing to the fullest extent, teaching methods and techniques that have already proved sound.

Industrial Arts Sections:

Alfred P. Smith, Indianapolis, Ind., and Fred J. Schmidt, Jr., Ball State Teachers College were section leaders.

1. Friday afternoon: "Modernizing the Industrial Arts Program." The emphasis was upon past experience, new materials, educational values of industrial arts and elementary industrial arts.

2. Saturday morning: "Modernizing Industrial Arts Facilities." This discussion was built around a panel made up of architects, a color technician, school administrators, and teachers, who emphasized streamlined design, remodeling, color and light, and new building materials.

Vocational Educational Sections:

Professor Ammon Swope, Purdue University, Mr. M. D. Mobley, and H. G. McCombs were section leaders.

In both the Friday afternoon and Saturday morning vocational educational sections, the emphasis was on:

1. Building trades and its contribution to schools, and organization of a training program.

2. Diversified occupations, community needs, and integration with school and community activities.

3. Trade extension — adequate provision for promotion, finance, enrollees, and instruction; and what new areas should be served by a trade extension program. — *Marvin R. Bell,* Indiana State Teachers College, Terre Haute, Ind.

♦ At a recent meeting of the Mu Sigma Pi, graduate fraternity in Industrial Education at Wayne University, the following officers were elected for 1945–46: president, Robert Shields; Vice-president, Arthur Dunham; corresponding secretary, James Hendrickson; recording secretary, Harold DeLong; treasurer, Gordon Rivers; executive board, Thomas Monroe.

Standing, left to right: James Hendrickson, Harold DeLong, Gordon Rivers. Seated: Arthur Dunham, Robert Shields

♦ Since the Illinois Vocational Association convention has been canceled, an informal dinner conference for vocational instructors, supervisors, and administrators in the metropolitan area has been planned for Friday, April 27, 1945, to be held at the Maine Township High School, Park Ridge, Ill.

Speakers will include J. C. Wright, Assistant U. S. Commissioner for Vocational Education, Washington, D. C.; J. C. Buckwalter, Douglas Plant Manager; and Carl King, Douglas Training Supervisor.

♦ The Linde Air Products Co., 30 East 42nd St., New York City, have made a well-integrated slide film training program on oxyacetylene welding and cutting operations available to teachers in vocational schools. The lessons are arranged in series form.

The cutting series consist of eight lessons, the welding series of ten lessons, and the safety series of one lesson. Each lesson consists of a slide film, three instructor's supplements, and 25 student's lesson booklets.

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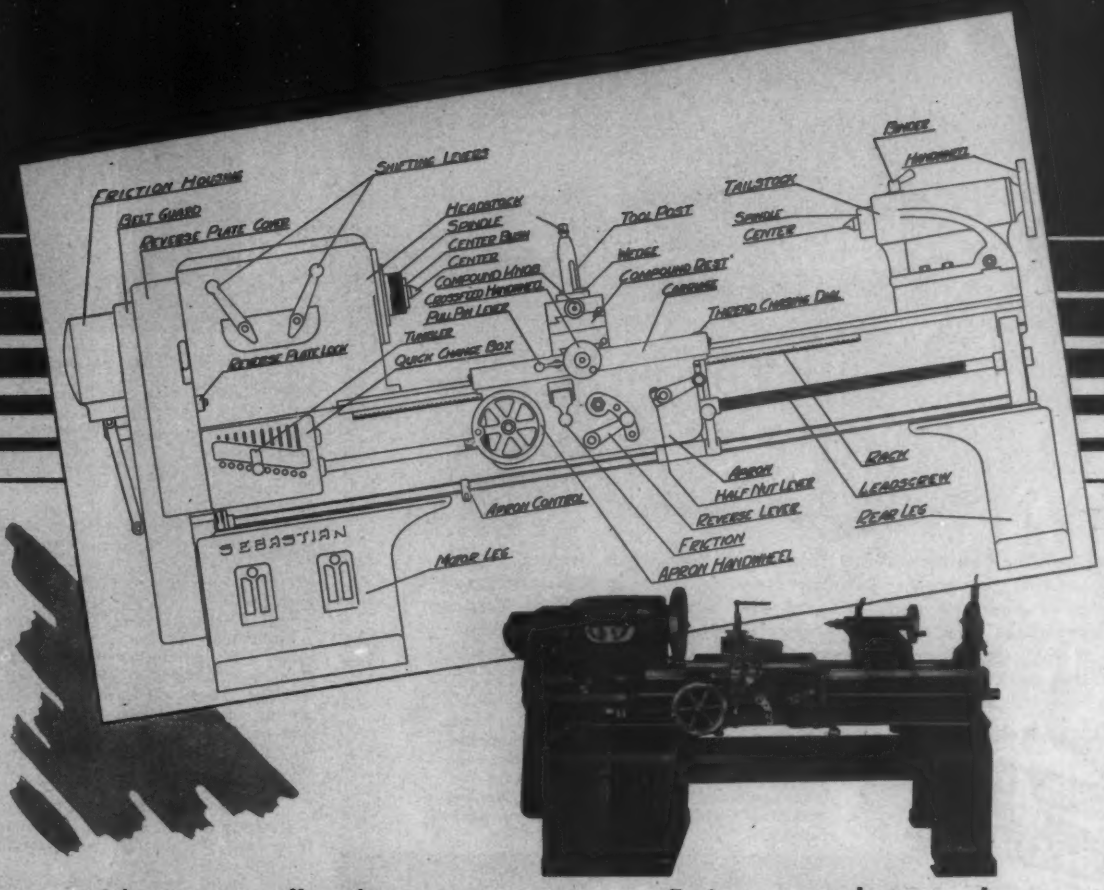

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Personal News

DR. CHARLES M. HERLIHY PASSES ON

The death of Dr. Charles M. Herlihy, president of State Teachers College, Fitchburg, Mass., on January 27, 1945, terminated the activities of a truly great man.

When he came to Fitchburg seventeen and a half years ago, nationwide surveys were showing that industrial arts must be studied in a scholarly way. Accordingly, he moved promptly in changing the industrial-arts department at State Teachers College from its three-year course to a four-year degree granting curriculum. Later the department offered graduate courses for the master's degree. These were among the early changes of their kind being made in the country at that time.

For years the department had worked in the crowded basement and attic of a building which was never intended for extensive shop activities. Dr. Herlihy led the fight which gave the department its new building. "Superior," said visiting experts in comparing it with accommodations used for like purposes in other parts of the country.

Centrally located in Massachusetts and New England, the building became a meeting place. School men and laymen, after being welcomed at its doors by Dr. Herlihy, returned to him for later visits and conventions. Like his fellow students and acquaintances, they said, "He enriched our minds and gladdened our spirits."

Off campus Dr. Herlihy's leadership was prominent. Because of his untiring efforts, exhibitions and programs on industrial arts were presented at several annual conventions held by the school superintendents of Massachusetts. He was serving very effectively on a most important committee now studying the future relations of industrial arts with vocational education.

Stimulated by his desires, his faculty mates visited cities and towns recommending and demonstrating improvements in industrial arts. College courses in this subject were conducted by his instructors in different parts of the state.

Dr. Chas. M. Herlihy

Dr. Herlihy was recognized as a national leader. Magazines sought his articles on industrial arts. Three years ago the American Vocational Association at its large national convention in Toledo, Ohio, welcomed his address on "The Professional Development of Industrial-Arts Teachers."

Alertly, Dr. Herlihy was anticipating and preparing for the development of his cherished subject during the coming years. Then, at fifty-three years of age his forward marching steps were halted.

He appreciated deeply the efforts of all who assisted him. His thoughts, his feelings, and his deeds will continue to inspire, to guide, and to strengthen a host of students and experienced workers. They will engage victoriously in promoting in the schools an industrial arts which will be a credit to the loved memory of their educational leader, their ideal of an earned civic servant, their own Dr. Charles M. Herlihy.—*Willis B. Anthony.*

ITHAMAR NYLAND DIES

Recently one of Hartford's best industrial-arts instructors, Ithamar Nyland, passed away at the age of 56.

His career, most of which was spent in Hartford, Conn., was a noble one and his passing was keenly felt not only by his students but by the faculty as well. His steadying influence and devotion to his profession was unexcelled.

His passing gave rise to the following eulogy on the editorial page of the *Hartford Courant* entitled, "Just a Teacher." Editorial writers so often write or commend the great, and it was so gratifying and refreshing to find that our colleague and friend was given this great tribute.

JUST A TEACHER

The other day a teacher died in Hartford. Except to his associates and to those several thousand former pupils whose lives were influenced by their contact with him during his 32 years of service in the Hartford schools, he was virtually unknown. Yet if one may judge the importance of an individual by the constructive good that he has contributed to the community, it must be said that Ithamar Nyland, teacher of manual arts at Bulkeley High School, was an important person.

His professional associates admired him most because they saw in his person the trinity of attributes that make the perfect teacher. For not only was he an excellent teacher, but he was a scholar and artist as well. Characteristically he pursued his artistic and scholarly interests in the same unostentatious manner that marked his work in the classroom. He painted in oils, but never bothered exhibiting them, not because

(Continued on page 26A)

"Guts", they call it in men . . . and "guts" goes for machines, too! In rain, mud, snow and ice . . . VICTOR can take it. Letters from G. I.'s the world over attest this. One letter specifically states, "Victor is the one projector that can take the beating."

Such performance and stamina isn't just happenstance . . . It's the result of 22 years' experience. Victor started to build "guts" into its 16mm equipment on that day when A. F. Victor produced the first Victor projector and led the way in its practical application for teaching in schools and churches . . . speeding production in Industry and training and entertaining the Military. Yes, Victor Equipment is truly 16mm Magic!

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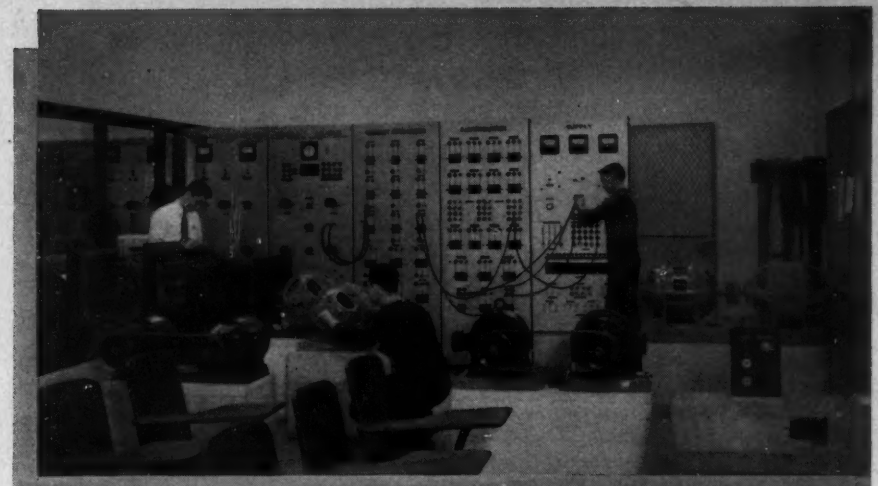

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Please mention *Industrial Arts and Vocational Education*

THE STANDARD ELECTRIC TIME CO., SPRINGFIELD 2, MASS.
Founded 1884

(Continued from page 24A)

he was a dilettante but because his art was a natural expression of himself, done for the pleasure of doing. He read avidly and kept abreast of educational developments both home and abroad. But because he was well informed he was able to maintain an even keel, and through sound evaluation was not taken in by every educational ism of the day.

He was just a teacher. But he was proud of his profession and always conscious of his responsibility in helping to shape the thinking of young minds that came to him year after year. Always he held firm to the basic pattern of learning, stressing fundamentals and disregarding the frills and flummeries that frequently pass for modern educational methods. Ithamar Nyland was just a teacher, but in his death Hartford lost an important citizen. He died as he had lived, quietly, modestly and almost unnoticed.

The following is a brief summary of Mr. Nyland's educational and professional career:

Graduate, Lynn High School, Lynn, Mass. — 1908.

Graduate, Boston Normal Art School, Boston, Mass. — 1912.

B.S. degree, University of New Hampshire — 1928.

M.A. degree, Trinity College, Hartford, Conn. — 1930.

1912–13 — Supervisor of Art, Canton, Mass.

1913–18 — Supervisor of Art, Arsenal District, Hartford, Conn.

1918–19 — U. S. Army Graduate, School of Military Aeronautics, Princeton University; Ground School Training, Kelly Field, Tex.

1919 — Instructor Industrial Arts, Yonkers, N. Y.

1919–22 — Supervisor, Manual Arts, Arsenal District, Hartford, Conn.

1922–26 — Hartford Public High School, Instructor of Mechanical Drawing and Shop.

1926–45 — Bulkeley High School, Instructor of Mechanical Drawing and Shop.

Mr. Nyland was a member of the Connecticut Industrial Arts Association and also belonged to many other educational groups.

♦ GEORGE C. HENRICKSEN, instructor of printing at Benson Polytechnic High School, Portland, Ore., was elected supervisor of vocational education. Mr. Henricksen just completed his work for his master's degree last December at the University of Minnesota under Dr. Homer J. Smith. Before he came to Benson 13 years ago, he owned a newspaper in the state of Washington. His bachelor's degree was taken at Luther College, Decorah, Iowa.

EDWIN A. ROBERTS

Edwin A. Roberts, 51, director of practical arts for the Rochester Board of Education since 1928, died suddenly (Sept. 1, 1944), at Strong Memorial Hospital.

A graduate of the University of Rochester, he began his teaching career at old Rochester Shop School (now Edison Technical and Industrial High School) in 1911. Roberts also taught at

Edwin A. Roberts

Washington Junior High School and Jefferson High School. He was made principal of Continuation School in 1921. Educated at Caledonia High School and Mechanics Institute (now Rochester Institute of Technology) before going to the U. of R., he also studied at Columbia and Cornell universities.

In World War I Roberts served as lieutenant with the field artillery. A son and a daughter are serving in World War II.

Roberts had been active in the local Craftsmen's Club, State Vocational and Practical Arts Association, American Vocational Association, Rochester and New York State Teachers' Associations, and National Education Association. In 1936 a dinner was held to mark his 25th year of service in the Rochester schools.

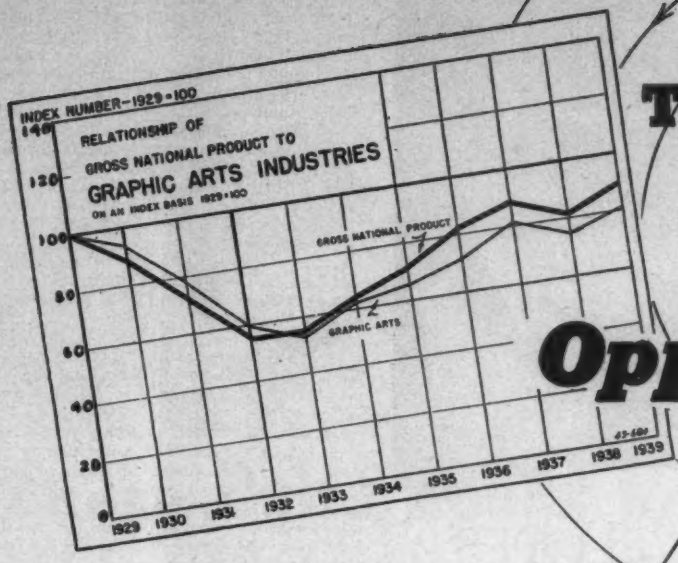
He leaves his wife, a son and two daughters.

♦ It is with deepest grief that we record the death on Sunday, March 25, 1945, of MRS. ORA BAWDEN, wife of Dr. William T. Bawden, head of the industrial education department, State Teachers College, Pittsburg, Kans.

♦ COMMANDER FRANK CUSHMAN, USNR, has been released from active duty with the navy and has returned to his post as consultant in vocational education in the vocational division of the U. S. Office of Education, Washington, D. C. Commander Cushman joined the staff of the federal board for vocational education in 1918 and served as regional agent for trade and industrial education until 1922. He was chief of the trade and industrial education service from 1922 to 1938 and consultant in vocational education since 1938.

Commissioned as Lieutenant Commander, USNR, he remained on the inactive list until called into active service in November, 1940. In 1942, he was promoted to the rank of Commander. During his active service in the Naval Reserve, he was concerned with the preparation

(Continued on page 28A)



Tomorrow's Printing Opportunities

are attracting Today's Youth

Young men and women . . . are showing keen interest in the unusual opportunities for steady, well-paying employment offered by various branches of the Graphic Arts. How extensive these opportunities are is proved by the chart above by the United States Department of Commerce. Note that printing production closely follows industrial production. Authorities say that five billion dollars will be spent for printing and affiliated products after the war.

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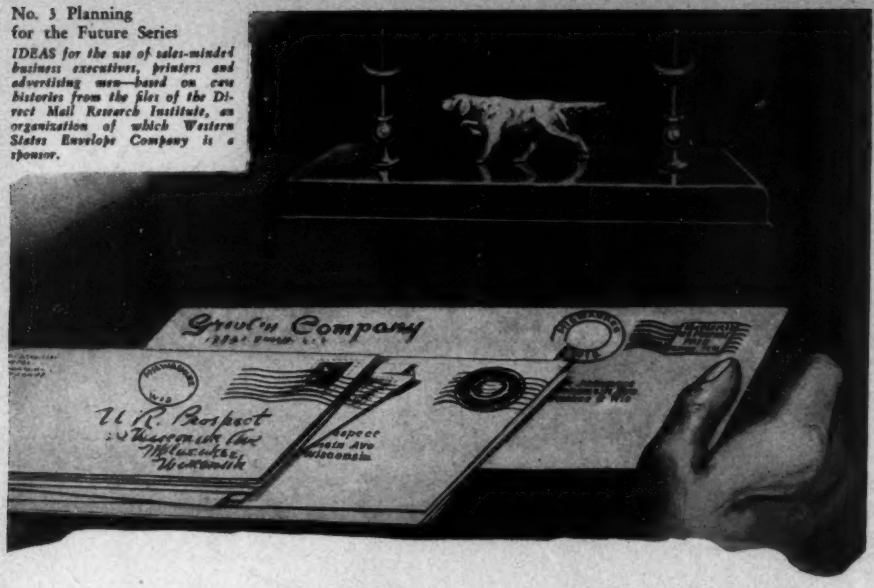
No. 5 Planning
for the Future Series

IDEAS for the use of sales-minded business executives, printers and advertising men—based on case histories from the files of the Direct Mail Research Institute, an organization of which Western States Envelope Company is a sponsor.



How COLORED ENVELOPES *Step Up Mail Returns!*

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Case history B-110 tells of an office appliance manufacturer who prepared a mailing of 37,000 letters and divided the list into six equal parts so that slightly over 6,000 persons received identical mailings in white, blue, goldenrod, pink, yellow and green envelopes. Returns were: Blue, first with 7.8 percentage of responses; yellow, 6.8 per cent; goldenrod, 6.4 per cent; green, 6.0 per cent; pink 5.8 per cent and white was last with 3.1 per cent. "This is ample proof that colored envelopes are more effective than plain white envelopes," the company advertising manager wrote.

Write us for FREE folder, "FACTS about COLOR." It will reach you promptly.

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PERSONAL NEWS

(Continued from page 26A)

of emergency plans for the training of mechanics in navy yards and other naval shore activities, served in the Shore Establishments Division in charge of civilian training in the field, and later as head of the Training Branch of the Division of Shore Establishments and Civilian Personnel.

♦ SUPERINTENDENT E. A. T. HAPGOOD, Mount Morris, N. Y., for some years assistant superintendent of schools at Albany, N. Y., is now connected with the Division of Finance, The New York State Department of Education, Albany, N. Y.

During Superintendent Hapgood's administration in Mount Morris, which included direction of *Vocational Education,* and adult evening schools, such constructive and progressive features as an enriched program from the kindergarten through senior high school, with industrial arts for both boys and girls, club and student activity periods daily as part of the regular program, an improved program for custodial care and maintenance of school property, were introduced into the local program.

♦ PAUL E. HARRISON, staff member of the industrial-arts department, and sponsor of Zeta Chapter, of the Epsilon Pi Tau fraternity at Northern Illinois State Teachers College, DeKalb, Ill., has been appointed educational analyst of the Second United States Army Air Force.

♦ MILO T. OAKLAND, chairman of the department of industrial arts at Northern Illinois State Teachers College, DeKalb, Ill., will act as sponsor of Zeta Chapter of Epsilon Pi Tau during the absence of Paul E. Harrison who has been assigned to special duties with the Second United States Army Air Force.

♦ HAROLD J. CAMPBELL, formerly instructor of general shop at the Charles Robinson Junior High School, Wichita, Kans., has been appointed woodworking instructor at the Junior High School, Ventura, Calif.

♦ HOWARD R. JUNKER, instructor in Engineering Drawing at St. Lawrence University, has accepted an appointment as instructor in Engineering Drawing at the College of Engineering of Cornell University. He will commence his new duties at the beginning of the new term in March.

Mr. Junker came to St. Lawrence in the fall of 1943 from the Port Washington Senior High School where he had been an instructor in industrial arts. He has also had experience in adult education for the Grumman Aircraft Corporation and the New York State Vocational Program at the Lynbrook State Aviation School.

♦ CARL F. HANSEN, director of the language department in the Technical High School, Omaha, Neb., has been named principal of that school to succeed Mr. Dwight E. Porter who will retire on September 1.

Mr. Hansen came to Omaha from Grand Island, Neb., in 1936, after having been high school principal there for ten years. He also taught at Wolbach, Neb., where he was born.

♦ DWIGHT E. PORTER, principal of the Technical High School, Omaha, Neb., will retire on September 1. Mr. Porter finishes his twenty-eighth year in the Omaha school system.

♦ DR. L. D. HASKEW has been appointed executive secretary of the Committee on Teacher Education. His address will be 525 W. 120th St., New York 27, N. Y.

Chairman is Professor E. S. Evenden, Teachers College, Columbia University, and other members are: Professor Karl W. Bigelow, also of Teachers College; Professor Russell M. Cooper, University of Minnesota; Professor Mildred English, Georgia State College for Women; President Charles W. Hunt, Oneonta (N. Y.) State Teachers College; Dr. A. J. Stoddard, Superintendent of Schools, Philadelphia; Dean Ralph W. Tyler, University of Chicago; and President George F. Zook, American Council on Education.

♦ The following, all of whom attended The Stout Institute, Menomonie, Wis., before they entered the armed services, have lost their lives in the service of their country.

Robert Bruce Antrim, assistant librarian at Stout from 1928 to 1942.

John Richard Aumiller attended Stout from 1936 to 1938.

Gerald Carswell, 1938–1939.
James Illingworth, 1940–1943.
Kenneth Raymond Johnson, 1940–1941.
Reed Jones, 1939–1941.
Robert Keith, 1937–1940.
Evert Ostrom, 1933–1934 and 1935–1938.
Charles Pleier, 1941–1943.
Roher L. Roland, 1936–1940.
Lyle J. Schultz, 1939–1942.
Edward Stanfil, 1938–1941.
Wilbur Henry Tschopp, 1939–1941.
Pat Welch, 1941–1942.
Edward S. Rock, 1942–1943.

Questions and Answers

WHITE LAYOUT COATING

1109. Q.: Please give me a formula for a white layout coating for metal surfaces. — *R. V.*

A.: Make a thick paste out of white lead, whiting, and boiled linseed oil. Add a small amount of dryer. Thin down this combination to the thickness of a thin paint with benzine. Apply it with a brush or with a rag.

No rigid proportions need to be adhered to in mixing the ingredients.

For an emergency job, whiting mixed with benzine or alcohol to the consistency of paint may be found satisfactory. — *J. J. M.*

1110. Q.: How do you finish oak to obtain the finish put on modernistic furniture by some manufacturers under the name of "Wheat or Bleached Oak?" — *H. W*

(Continued on page 31A)

These Delta books help you make your school shop program a vital factor in the *Blueprints for Winning the Peace*

1. **"How To Plan A School Workshop"** provides you with photographs and layout drawings of 30 typical shops, for schools large and small. Also serves as a condensed guide to principles of shop planning . . . to the selection, placement, and efficient use of the major power tools. **FREE**

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IT pays to let these Delta books help you keep well informed on planning and equipping the school shop. For upon you in the industrial arts field, the imminent reconstruction period places a great obligation.

You share in the vital responsibility of determining whether the end of World War II shall bring a peace that means merely the cessation of hostilities . . . or a peace that means greater economic security for America.

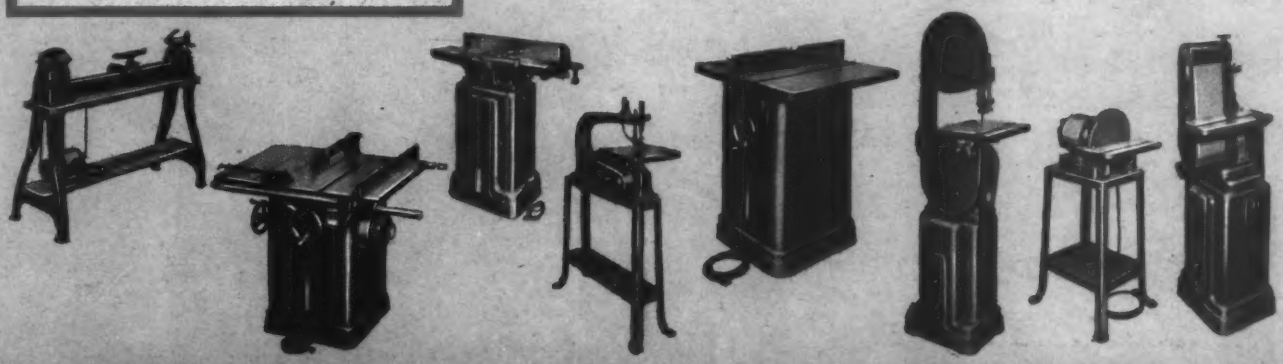
Whether men and women take advantage of your peacetime shop program — when individual initiative replaces mass job education dramatized by war — depends to a great extent upon how attractive and worthwhile your facilities and courses of study are.

That's why so many vocational educators — in both administrative and teaching capacities — look to Delta for practical help in planning *now* to meet the needs of (a) war veterans; (b) workers who require readjustment to new jobs — or upgrading to advanced job classifications; (c) secondary school graduates without technical training.

Thorough understanding of school shop requirements — gained from long experience in the industrial arts field—permits Delta to offer you authentic guidance, of value from the standpoint of economy, safety, convenience, teaching efficiency.

Fill in the coupon on the reverse side of this page, to get the three Delta books described here—helpful working tools in formulating a program that provides greater opportunity for training to the standards of modern industry.

Turn the Page



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- Delta 12" Woodworking Lathe
- Delta 14" Band Saw (wood-cutting or metal-cutting)
- Delta Cut-Off Machine

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Certain tools are available to schools under automatic priorities (CMP Regulation 5a). Consult your Delta distributor.

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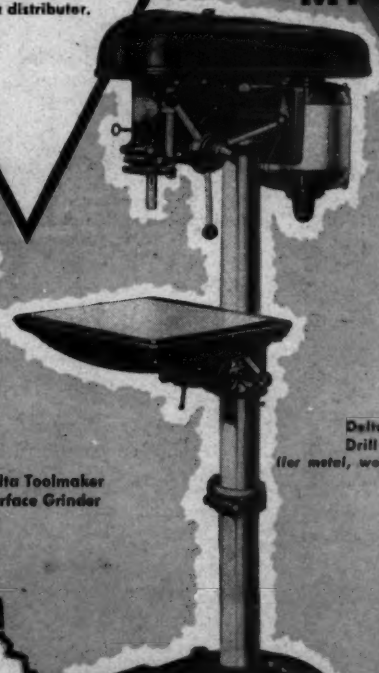
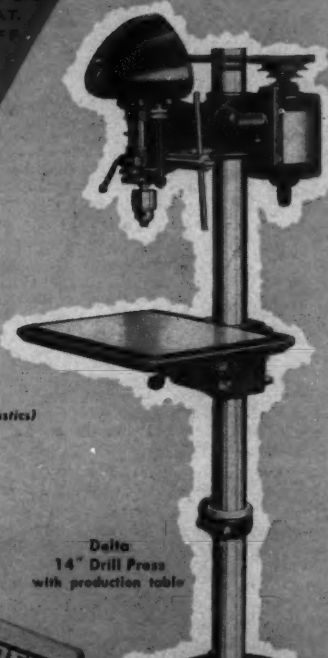
Delta Toolmaker Surface Grinder



Delta 17" Drill Press (for metal, wood, or plastics)



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(It is not necessary to buy Index to get free books)

(Continued from page 28A)

A.: To give oak the modernistic finish called wheat or bleached oak, bleach with No. 1 and then with No. 2 solution of wood bleach according to the manufacturer's directions. Be careful not to get any on the skin at any time and wear rubber gloves at all times. Protect the eyes with suitable goggles to preclude spattering. Dry overnight in a clean, warm room.

Seal with a thin spray coat of clear, bleaching lacquer diluted according to the label directions for the particular brand used. Sand lightly with 6/0 garnet finishing paper without cutting through the lacquer at any place. Dust off and recoat with a light and thin application with the spray gun. Dry hard.

Rub with 2/0 steel wool pads until a very smooth and even sheen is produced. Dust off and then fill with a standard "natural" filler to which has been added one half pound of zinc oxide paste per gallon of filler. Pad in well, clean off across the grain and clear up with clean rags until the surface is clear and free of smudges. Dry overnight in a warm room.

Spray with a light but even coat of clear lacquer. Dry overnight and then rub with 2/0 steel wool pads, loaded with hard floor wax, to an even feel and sheen. Avoid cutting through in any way. Dry fifteen minutes, then polish with cotton flannel rags. — *Ralph G. Waring.*

1111. Q.: Can the wheat or bleached oak finish be obtained on old wood if the varnish has been removed and a new surface has been exposed? — *H. W.*

A.: To obtain the wheat or bleached oak finish on old wood, be sure to get off the old finish entirely; also all colored filler that may be in the pores. This filler should be taken out with a steel scratch brush before sanding. Avoid using the steel brush in any direction but with the grain. Then continue with the directions given under Question 1110. — *Ralph G. Waring.*

News Notes

♦ On March 1 the Wisconsin State Board of Vocational and Adult Education issued a bulletin "Continuing Educational Opportunities Through Wisconsin Schools of Vocational and Adult Education." The purpose of the bulletin is to interpret to the general public, demobilized service personnel, and interested agencies the philosophy and structure of the Wisconsin system of vocational and adult education; the kinds of educational opportunities available and the factors influencing further development of vocational and adult education in Wisconsin.

The 48-page, 6 by 9 in. bulletin may be obtained without charge by writing to the Wisconsin State Board of Vocational and Adult Education, C. L. Greiber, director; or to any local director of vocational and adult education.

♦ Separate curriculums in vocational industrial education and industrial arts education are now available in the Department of Industrial Education at The Pennsylvania State College. Courses in both curricula will be available this summer on both a graduate and undergraduate level. Students may major in either vocational industrial education or industrial arts education, for the undergraduate degree of B.S., or for the graduate degrees of M.S., M.Ed., Ed.D., or Ph.D.

The Main Summer Session is six weeks in length and will be held from July 2 to August 10. An Inter-Session, three weeks in length, begins on June 11 and ends on June 29. A Post-Session, also three weeks in length, begins August 13 and ends August 31. Most of the courses offered by the Department of Industrial Education are concentrated in the Main Summer Session. Short unit courses are available, and students may plan 2, 4, 6, 9, or 12 weeks' study, and complete from 2 to 12 credit hours of work.

Catalogs and other information may be had by request sent to the Director of the Summer Sessions, The Pennsylvania State College, State College, Pennsylvania.

Filing Hints To Meet Your Needs
Lathe Filing
Widely used in industry for fitting and finishing shafts, lathe filing is an operation in which the file is stroked against the work while it revolves in a lathe. Lathe filing is commonly employed to correct the slight taper that sometimes results where the lathe cutting tool has been improperly ground or set for the wrong lathe speed or feed.
First,—select a Mill File. Or, if available, use a Long Angle Lathe File. Hold the file at a slight angle as shown in the illustration—with the work revolving towards the operator. Use a long forward steady stroke, moving laterally about half the width of the file on each stroke.
Beginners should be careful not to hold the file rigid or stationary, but to keep stroking continually.
NUCUT "Wavy Tooth" construction is a patented combination of coarse teeth and fine teeth that makes possible clean, deep, true cutting and also smooth finishing, both at the same stroke.
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Newark, New Jersey • Newcomerstown, Ohio
America's Oldest File Manufacturers
Good Tools since 1836
HELLER NUCUT FILES
WAVY TEETH

♦ A critical shortage of qualified physical therapists which endangers the proper care of infantile paralysis victims has caused The National Foundation for Infantile Paralysis, 120 Broadway, New York 5, N. Y., to appropriate $1,267,600 for the training of these vitally needed specialists, Basil O'Connor, president, announced recently.

Present-day medical treatment of patients with infantile paralysis demands more and more physical therapy. "A physical therapist is a technician who uses physical agents such as heat, electricity, light, exercise, rest, muscle training, and similar methods in contrast to the use of drugs, biological, and surgical technics.

The $1,267,600 program developed under the guidance of a special committee established in the field of physical therapy consists of three parts:

1. $1,107,000 for scholarships to train new physical therapists;
2. $82,000 for fellowships to provide additional teachers;
3. $78,600 for general development of the field of physical therapy.

♦ A new 16-page illustrated booklet on "How and Why Cathode Ray Tubes Work," including a discussion of television setups, has been announced by North American Philips Co., Inc., 100 East 42nd St., New York.

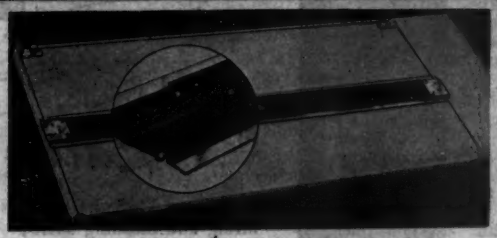
The text material is divided into four sections, the first of which contains the early history, mathematical concepts, and present-day problems. Section 2 takes up C-R tube manufacturing problems. Testing of C-R tubes is the subject matter of Section 3, and Section 4 goes into special C-R tube designs. This section also contains television setups along with lens systems, color filters, and three-color screens.

♦ "Life Line of the Nation," a new, two-reel color motion picture produced for the Association of American Railroads, has just been released.

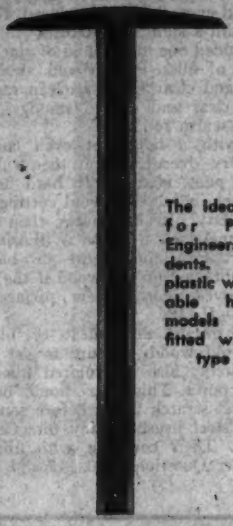
(Continued on page 33A)

PRECISION DRAFTING EQUIPMENT FOR TODAY'S STUDENT

ESCO Plastic Divider with interchangeable points and realignment feature. An instrument that feels at home in the hand.



Mobile Parallel Ruling Straightedge. The finest straightedge obtainable today. Equipped with retractile rollers which prevent smudging of drawing. Every school drafting room should have one of these.



The ideal T-square for Professional Engineers and students. Laminated plastic with removable head. All models can be fitted with Swivel type head.

ESCO Products

REG. U.S. PAT. OFF.

SYMBOL OF SUPERIORITY

ESCO provides the student with the finest Drafting and Navigating equipment obtainable.

ESCO qualifies by meeting the exacting requirements of War industries and the Armed Forces.

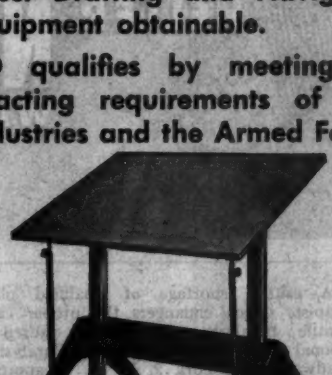
Navigator's Case with ESCO Plastic Compass and Divider. Also contains Screw Driver and Vial with extra leads and points. A useful set for the student and seasoned navigator.

Student Drawing Kit consisting of Drawing Board Formica T-Square, and two transparent plastic Triangles.

Durable, accurate Plastic Parallel Rulers for navigation and other purposes. Used by the U. S. Navy.

A leatherette covered Carrying Case designed for our Professional Kit — with pocket for drawings and tracings. A very practical and usable piece of equipment.

A handy refillable type Pencil Pointer with Felt pad to clean pencil point. Ideal for the classroom.



Drafting Tables with the ESCO 5-ply top. Comes equipped with or without Parallel Ruling Straightedge — sizes 21" x 26" Top through 30" x 42" Also in five larger sizes. Table is adjustable to height.

The ESCO Professional Drawing Kit. Five-ply board, parallel ruling Straightedge, elevating arms, and suction cup feet. Sizes 12" x 14" through 30" x 42".

ENGINEERING MANUFACTURING COMPANY

702 CLARA AVENUE, SHEBOYGAN, WISCONSIN — 11 S. LASALLE ST., RM. 1217, CHICAGO, ILL.

DOVETAIL WORK AND FUN FOR YOUR P. I. T.s!

Ask your Pre-Induction Trainees to draw the correct orthographic views of this Dovetail Slide Bearing. A sound working-lesson that will be a help in teaching your future technicians blueprint-reading—something they'll have plenty of use for in the Service.

This lesson can be fun, too, if you provide your students with the drawing pencil that's a pleasure to use—Typhonite Eldorado. This great pencil is uniformly graded in every one of its degrees. Its leads are grit-free; non-crumbling, non-feathering. And every *Eldorado* line well-drawn is sharp, clean and concise.

SOLUTION: We will send you a free blueprint showing the solution of this problem. Write to the address below within thirty days. Specify Blueprint No. 128-J5.

DIXON'S
TYPHONITE
ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT., JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY 3, N. J.

NEWS NOTES

(Continued from page 31A)

The picture is available upon payment of a small service fee and makes a special appeal to schools and colleges, in their study of transportation.

Users may secure the film by writing to The Princeton Film Center or the Association of American Railroads, Washington, D. C.

♦ The Civil Service Commission has announced opportunities in the fields of administration and personnel management for persons experienced in the management of public or private organizations. Most positions to be filled from the examinations are in Washington, D. C., with only a few in other parts of the country and abroad.

Administrative and Executive Officers ($5,228 to $8,628 a year) are wanted to assist in the direction of various government activities, including the disposal of surplus property and the renegotiation of contracts. Only those applicants with responsible administrative experience will be considered for these positions.

Position classifiers, placement officers, and personnel assistants ($3,163 to $6,228 a year) are needed for jobs in the personnel management programs of federal agencies. Applicants must have had 3 years of responsible experience, or a combination of experience and college training, to qualify for the $3,163 positions. More experience is required for the higher grades.

Ask at any first or second-class post office for copies of announcements 353 and 354, and application Form 57. The announcements and application forms can also be obtained at the Commission's Regional or branch offices or from the Commission in Washington. Applications must be filed with the United States Civil Service Commission, Washington 25, D. C.

♦ The Metal and Thermit Corporation, New York 5, N. Y., has published a 24 by 37-in. four-color wall chart with specific information on welding electrodes.

The electrodes have been divided into four groups: mild steel, special steel, stainless steel, and hard surfacing.

Free copies are available for welding departments.

♦ Helpful information on opportunities in *Beekeeping* and *Physical Therapy* may be found in two new occupational abstracts just published by Occupational Index, Inc., New York University, New York 3, N. Y., at 25 cents each.

♦ HOWARD V. GUNDERSON, educational consultant for the Office of Co-ordinator of Inter-American Affairs, reports that a vocational school is being planned for Paraguay.

Mechanics and engineering will be stressed. American instructors from the United States will

(Continued on next page)

A Tribute to Homer John Smith

HOMER JOHN SMITH, distinguished son of Wisconsin: In recognition of your outstanding National Leadership in the field of Industrial Education, we of THE SHIP salute you.

Your enduring faith in the youth of America, as exemplified in your life, consecrated to the great Profession of Teaching . . . your educational contributions as a Lecturer, Author and Teacher, supplemented by your readiness to serve . . . your proven devotion to the fundamental educational philosophy of Learning Through Creative Effort . . . all these, combined with a sympathetic understanding of human values in our American Industrial Way of Life, have enabled you to give to America that Educational Leadership that has made, and will continue to make, America the Land of Opportunity.

Dr. Homer J. Smith, Professor of Industrial Education, University of Minnesota . . . for almost forty years you have associated with the youth of America, serving and guiding them in the ideals of Democracy, that America may continue to be a nation of Free Men.

American Industry, through its Educational Representatives, THE SHIP'S CREW, has been very mindful and appreciative of your untiring interest and cooperation that is bringing ever closer together the Educational and Industrial Interests of American Democracy.

Dr. Homer J. Smith, we of THE SHIP are honored for this privilege to pay tribute to you and your constructive leadership. Again . . . we salute you . . . as we wish you many more years through which to carry on to even greater heights of achievement in American Industrial Education.

Given under our hand and seal this eighth day of December, One thousand, nine hundred and forty-four, A.D., during the thirty-eighth Annual Convention of the American Vocational Association, held in the City of Philadelphia, State of Pennsylvania.

The Ship

SHIP'S COMMITTEE ON RECOGNITION OF VALIANT SERVICE.

Tribute given by "The Ship" to Dr. Homer J. Smith at the A.V.A. Convention in Philadelphia

If it's a small part

. . . turn it with Precision, Speed and Profit

on a **SHELDON LATHE**

Model S-56
10" Precision Lathe

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. The lathe selected by U. S. Army, the Navy and the Marine Corps, for mechanized machine shops, instrument repair shops, etc.

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Bronze or anti-friction bearings
- 1" Collett capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

All SHELDON lead screws are cut on the finest Pratt & Whitney "Super-precision" lead screw machine.

BUILDERS of GOOD LATHES since 1919

SHELDON MACHINE CO., INC., 4244 N. Knox Ave., Chicago 41, U.S.A.

(Continued from previous page)

be on the instructional staff until sufficient Paraguayans have been trained to take over.

Similar schools already have been started in Brazil and in Panama. Others will be opened in Peru and other Latin-American countries.

♦ Thirty-two new training films for use in vocational schools and war industries were announced by the U. S. Office of Education, Washington, D. C.

These films are 16mm. sound motion pictures. They cover subjects such as woodworking, foundry work, aircraft maintenance, and machine-shop work. Two are of special importance in rehabilitation work, showing the use of blind workers in industry. Accompanying each motion picture is a film strip, which reviews important points in the film, and an instructor's manual.

For further information write to Castle Films, 30 Rockefeller Plaza, New York 20, N. Y.

♦ National Boys and Girls Week celebrates its twenty-fifth anniversary this year from April 28 to May 5 inclusive.

The program for your school, or better yet, your community may be scheduled as follows:

Parade day, Saturday, April 28.
Day in Church, Sunday, April 29.
Day in School, Monday, April 30.
Health and Safety Day, Tuesday, May 1.
Home Service Day, Wednesday, May 2.
National Service Day, Thursday, May 3.
Day in Occupations, Friday, May 4.
Day of Recreation, Saturday, May 5.

A "Manual of Suggestions" may be obtained free by writing the National Boys and Girls Week Committee, Room 980, 35 E. Wacker Drive, Chicago 1, Ill.

♦ The University of Idaho mobile education unit, illustrated herewith, suggests a pattern for postwar educational projects not only here but abroad. It was designed to assist the university in taking its agricultural course to the most remote corners of the state. It is operatable in areas where even electric power is lacking. It is equipped with DeVry motion picture sound equipment, amplifiers, speakers, and cameras. The unit is powered with a 3000-watt portable generator that makes it absolutely independent of power lines.

Agricultural education mobile unit used by the University of Idaho

Central figure in the photograph is Harrison C. Dale, president of the university, testing the amplifier. At left is Dean E. J. Iddings, director of extension. At right, Prof. Hobart Beresford, who supervised construction.

♦ The reorganized Standing Committee on Citizenship of the National Education Association has published a booklet for use in developing Citizenship Week programs entitled *Citizenship Program Aids: A Cooperative Project.*

The 72-page pamphlet may be obtained for 15 cents from the Superintendent of Documents, Washington, D. C.

♦ The weary, footsore, demobilized serviceman who is required to go to at least five different agencies in the process of transferring to civilian status will be gratified to know that plans are under way to reduce further legwork in securing authentic information and guidance.

These plans include a program for the training of representatives of the many interested agencies. Such training will prepare these individuals to answer correctly the "who, what, where, when, why, and how" questions of the inquiring ex-serviceman.

This guidance service is being developed by California educators and invited representatives of governmental and veterans' organizations who met at the California Polytechnic college in San Luis Obispo from February 12 to 23. The conference was conducted jointly by three branches of the state department of education: the division of readjustment education, the bureau of occupational information and guidance, and the California Polytechnic college.

Material and procedures developed at this conference will be made available to local communities.

♦ Through the cooperative efforts of the communities of Bonne Terre, Flat River, Elvins, Esther, Desloge, Leadwood, and Frankclay, Mo., an area trade school, known as the Lead Belt Trade School, has been established at Bonne Terre, Kans. The courses offered are machine shop, welding, and general metal trades. A school bus transports the students to and from their respective districts.

Another of these area schools has been opened at Wellston, Mo.

♦ The International Association of Chiefs of Police, Safety Division, 1827 Orrington Ave., Evanston, Ill., announce that to save passenger cars from the scrap heap, to maintain adequate transportation for warworkers, and to reduce traffic accidents, the nation's police are making final plans to conduct a brake check program in every state.

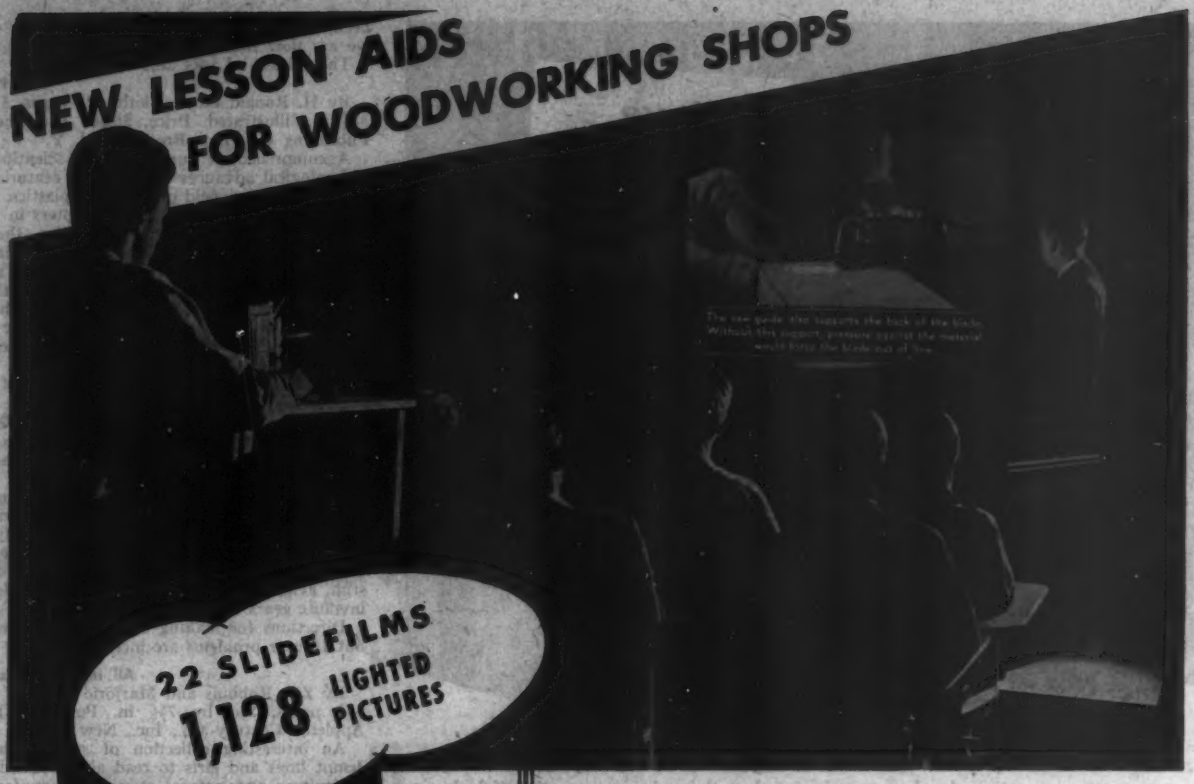
The program, sponsored by the International Association of Chiefs of Police, will start April 15 and end June 1. More than 5000 chiefs of police and sheriffs will participate.

♦ Thirty-three film strips which deal with contemporary life in the United States were released this month by the American Council on Education, 744 Jackson Place, Washington 6, D. C.

Seven of the titles deal with the regional geography of the United States. The six succeeding subjects take up the individual regions in more detail bringing out regional characteristics in terms of climate, topography, people, indus-

(Continued on page 36A)

NEW LESSON AIDS FOR WOODWORKING SHOPS



Instructional Program of SAFE PRACTICES IN WOODWORKING

Instruction — Review — Test

WOODWORKING TOOLS AND MACHINES

1. Hand Tools—Hammers—Saws
2. Planes—Bits—Knives—Chisels—Screwdrivers—Files
3. Tool Grinder
4. Drill Press
5. Jig Saw
6. Band Saw
7. Disk Sander
8. Belt Sander
9. Lathe—Parts—Spindle Turning
10. Lathe—Faceplate Turning—Other Operations
11. Planer
12. Jointer
13. Circular Saw—Parts—Installing Blade
14. Circular Saw—Setting Up—Operating

BASIC SAFETY

1. Play Safe and Work Safely
2. Maintaining a Safe Shop
3. Safety Inspection
4. Training for Emergencies
5. Treatment for Bleeding—Shock—Preventing Infection
6. Aid for Injuries—Fainting—Burns
7. Eye Protection
8. Power Supply

THIS COMPLETE KIT-SET

$81.60

f.o.b. DETROIT

Specially Planned . . . Specially Designed to Help Teach Basic Safety and Shop Work in Schools . . . Each film contains 50 to 75 clear, carefully planned, graphic illustrations and descriptions, arranged in lessons—ready to teach. Each lesson concludes with a complete set of pointed review and test questions that fix a visual pattern for each topic in the student's mind.

These discussional slidefilms are specially prepared for school use. They are direct and effective teaching aids, based on up-to-date shop practices.

SOME ADVANTAGES OF USING SLIDEFILMS IN TEACHING

★ Lighted illustrations—clear, sharp photographs or simple, graphic, professional drawings, done by experts—help teachers simplify and clarify the most complicated topics.

★ Pictures of small and intricate parts are shown in close-ups—greatly enlarged—so that all can see.

★ Pictures can be projected as long as needed . . . or changed as quickly as desired.

Produced by The JAM HANDY Organization

10-DAY TRIAL

This Jam Handy Kit-set is sold on a ten-day trial. See for yourself!

FILL OUT COUPON AND MAIL—TODAY!

The Jam Handy Organization
2900 East Grand Blvd., Detroit 11, Michigan
Please enter our order for the Woodworking Kit-set.

Name_____

Position_____

Organization_____

Address_____

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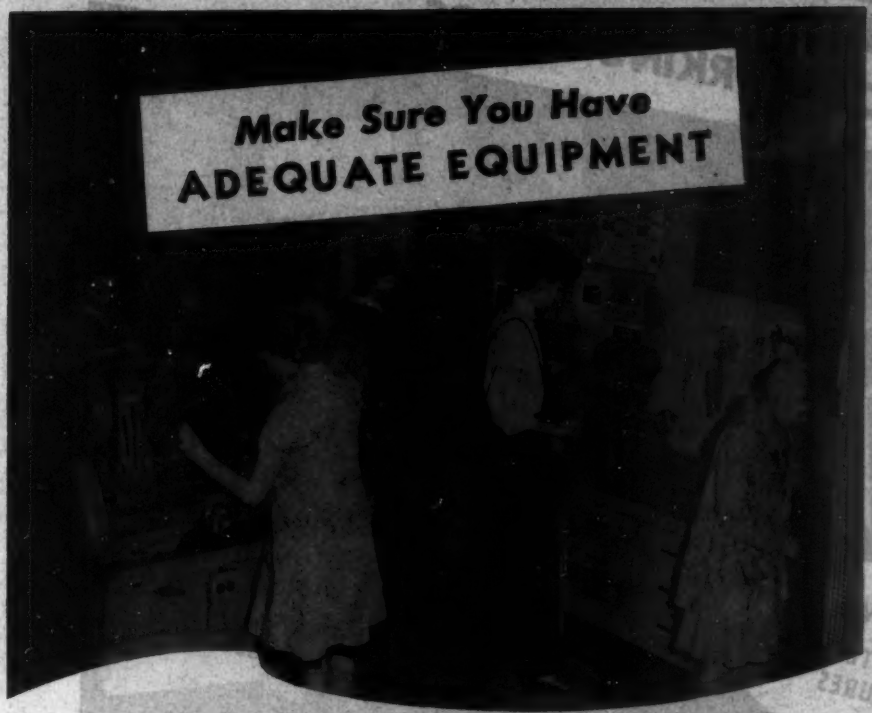
Detroit Public Library

WRITE FOR CATALOG OF SLIDEFILMS ON OTHER SUBJECTS



TO measure up to the "skill" training that will be required after the war, many vocational educators insist that the minimum ratio of lathes to students be 1:2.

This is to assure enough practical machine time to acquire dexterity and experience for quick orientation into the specific jobs industry will have for them.

Atlas lathes are ideally suited for such class room work. They encourage precision. They are provided with all operating safeguards. They are made by advanced methods — at low cost — so that more machines can be purchased on limited equipment budgets. Send for latest catalogs.

ATLAS PRESS CO., 571 N. Pitcher St., Kalamazoo 13D, Michigan

(Continued from page 34A)

tries, and products, as well as indicating the interdependence of the different regions.

The film strips are for sale only. They are priced at $1.50 each; any seven for $10; the complete set of 33 for $45. Prices include two copies of the English script for each film strip. A limited number of scripts are available in Spanish for language classes. Spanish scripts are priced at 10 cents each.

New Publications

Mathematics for Machinists

By R. W. Burnham. Cloth, 253 pages, 5 by 7⅜ in., illustrated. Price, $1.50. John Wiley & Sons, New York, N. Y.

This is the second edition of this book for training mechanics. It contains a review of the four fundamental arithmetical operations as applied to common and decimal fractions, and covers measurements, mensuration, volumes and weights, and powers and roots.

Applications of the foregoing are then shown for lathe work, planer and shaper work, the drill press, and the milling machine. There are also chapters on shop trigonometry, and materials and processes.

An appendix containing a number of useful tables has been added.

Textiles

By William H. Dooley. Cloth, 790 pages, 5¾ by 8 in., illustrated. Price, $4. D. C. Heath and Company, Boston, Mass.

A fine informative book on the related subject matter to be used in classes on dressmaking, clothing, costume design, and retail and wholesale selling.

Starting with the various fibers, the book explains how they are used in making the numerous types of cloths in common use, describing also the varied weaves that have been devised to produce the fabrics with which we are now familiar.

The subject of furs also is covered.

Plastics

By H. Ronald Fleck. Cloth, 325 pages, 5¾ by 8¾ in., illustrated. Price, $6.50. The Chemical Publishing Co., Inc., Brooklyn, N. Y.

A comprehensive survey of the scientific and technological advances made in the centuries-old, yet very modern field of synthetic plastics.

The book is divided into 15 chapters in which are discussed the history of plastics, the raw materials used, the principles of polymerization, chemistry of plastic materials, methods of manufacturing used, synthetic rubber, properties of thermoplastic materials, properties of thermosetting materials, synthetic resins, synthetic fibers and textiles, synthetic resin adhesives, dies and molds, and analysis of raw materials.

The book also contains a number of very helpful tables.

Spur Gearing

By W. M. Owen. Paper cover, 63 pages, 6 by 9 in., illustrated. Price, 72 cents. Published by McKnight & McKnight, Bloomington, Ill.

A well-written little book on the puzzling subject of gearing. While only spur gearing is touched upon, it is done in a thorough way. The gear systems described are: 14½-deg. involute, 14½-deg. composite, 20-deg. involute, 20-deg. stub, Fellows stub, and long and short addendum involute gears.

Directions for making 8 drawing and working out 10 gear problems are included.

All in the Day's Work

By Zila Robbins and Marjorie Medary. Cloth, 338 pages, 5¼ by 7⅝ in. Published by D. Appleton-Century Co., Inc., New York.

An interesting collection of stories that will tempt boys and girls to read about vocations in agriculture and natural resources, manufacturing and industry, and transportation and communication.

Manual of Inspection

Imitation leather, spiral binding, 161 pages, 5¼ by 6 in., illustrated. Published by The Parker Appliance Co., 17325 Euclid Ave., Cleveland, Ohio.

A concise, comprehensive explanation of the methods used by inspectors who make sure that the fine precision requirements called for in present-day war production work are fully met.

The material is divided into four sections under the following headings: Visual Inspection; Measurements; Plain Gages; Threads, Thread Measuring, and Thread Gaging.

The book also contains a glossary of terms used by inspectors.

Welding Instructions and Standards — Part 1 Symbols

Paper cover, spiral binding, 82 pages, 8½ by 11 in. Price, 50 cents. Carnegie-Illinois Steel Corporation, Pittsburgh, Pa.

A well-illustrated book which shows how to give full welding instructions on drawings.

Continuing Educational Opportunities

Issued by The State Board of Vocational and Adult Education, Madison, Wis. Paper cover, 48 pages, 6 by 9 in., illustrated.

A full explanation of what the Wisconsin system of vocational and adult education has done in the past and what it will do in the future for the people of the state, in the way of giving vocational training and vocational guidance and counseling.

A.V.A. Bulletin — An Enlarged Program of Vocational Education with Special Reference to Larger Administrative Units

Paper, 52 pages, 6 by 9 in.

A report of the A.V.A. Research Committee presenting the growing need for extending the benefits of vocational education to all youth and adults throughout our land. It discusses the social and economic trends arising out of the deferred age of entrance into employment, population movements, the increasing number of women into industry and the consequent broadening conception of vocational education.

Vocational Education for a Changing World

By F. Theodore Struck. Cloth, 550 pages, 5¾ by 8⅝ in. Price, $3.50. John Wiley & Sons, Inc., New York; and Chapman & Hall, Ltd., London.

(Continued on page 38A)

NO SCHOOL CAN DO JUSTICE TO ITS G.I. TRAINEES

with "Too Little" or "Too Old"!

THESE men and women are planning on taking their places in highly modernized industrial plants — and hope to get from your school the type of training that will give them a "flying start" on doing justice to their opportunities.

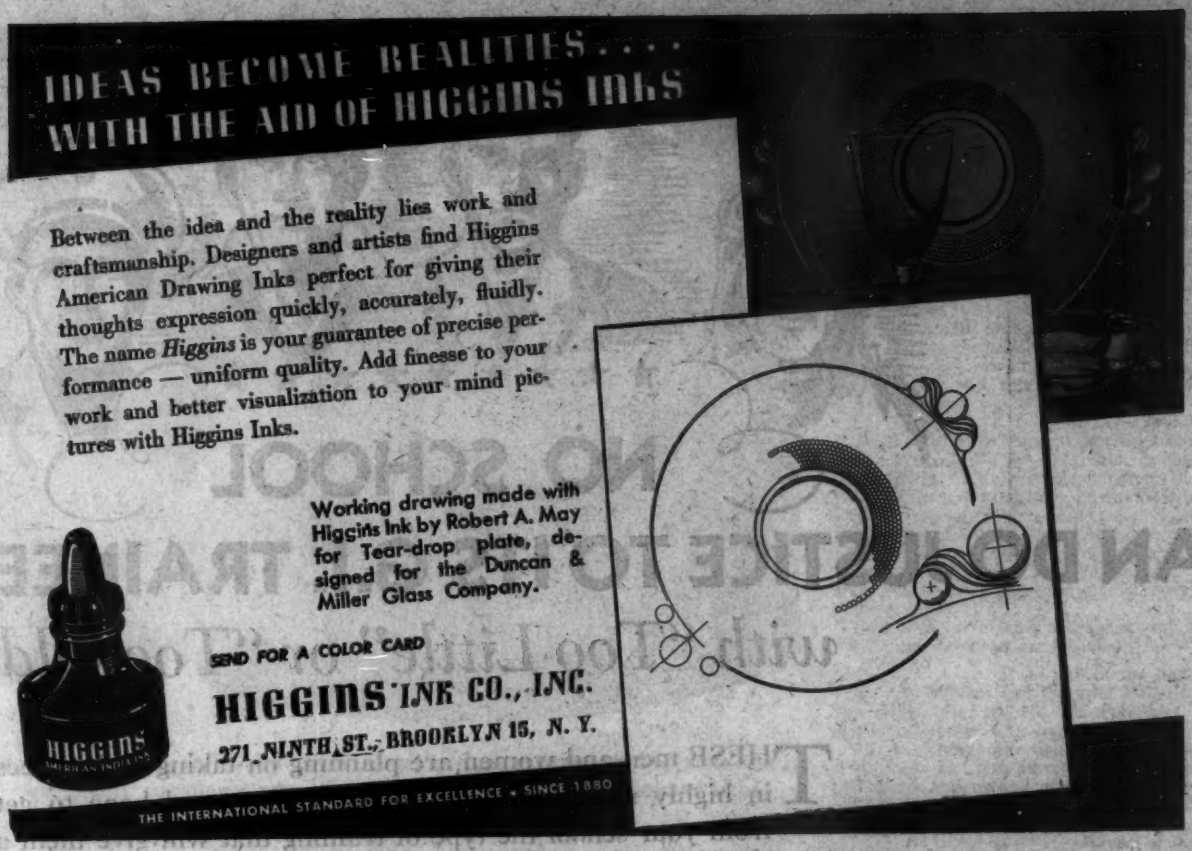
If the training any school is giving is limited in scope or modern application because of too little equipment, or outmoded machines, the result will be that these trainees are actually going to be sent into the peacetime production battle less equipped and trained *than they were for war*. And that's not the way Uncle Sam planned it!

None but the best *must* be good enough for these returning G.I. And so, to help you plan your department, enlarge it, or modernize it, Brodhead-Garrett is ready to supply all the available modern equipment, modern machines, and supplies that you need. To expedite deliveries, we suggest that you send your entire order at one time.

BRODHEAD-GARRETT CO.

"Supplying Defense Training Needs to Schools in All 48 States"

CLEVELAND, OHIO


IDEAS BECOME REALITIES . . . .
WITH THE AID OF HIGGINS INKS
Between the idea and the reality lies work and craftsmanship. Designers and artists find Higgins American Drawing Inks perfect for giving their thoughts expression quickly, accurately, fluidly. The name Higgins is your guarantee of precise performance — uniform quality. Add finesse to your work and better visualization to your mind pictures with Higgins Inks.
Working drawing made with Higgins Ink by Robert A. May for Tear-drop plate, designed for the Duncan & Miller Glass Company.
HIGGINS
SEND FOR A COLOR CARD
HIGGINS INK CO., INC.
271 NINTH ST., BROOKLYN 15, N. Y.
THE INTERNATIONAL STANDARD FOR EXCELLENCE • SINCE 1880

(Continued from page 36A)

This book presents a clear and explicit exposition underlying the work offered under the general title of industrial arts and vocational education. The main emphasis, as the title indicates, is on the various types of vocational education.

The 24 chapters into which this book is divided discusses the subject under: nature, purpose, and scope; comparing practical arts and vocational education; types of vocational classes and schools; general welfare and vocational education; federal and state laws and administrative agencies, policies, and plans; basic vocational education principles; local initiative, responsibilities, and administrative agencies; the American Vocational Association; employer and labor organizations, laws, and labor relations; trade and job analysis, vocational education surveys; vocational guidance and adjustment; accident prevention; and the various specific types of vocational education.

How to Select Foremen and Supervisors

By R. C. Oberdahn. Cloth, 53 pages, 5½ by 8⅛ in. Published by National Foremen's Institute, Inc., Deep River, Conn.

Written by a man who had considerable experience in the training and selection of those who are to supervise workers, this brief, plainly written book will be found helpful by personnel managers and others in selecting the proper kind of foremen.

The book also ought to be read by those who hold supervisory positions in our industrial shops.

How to Work with Tools and Wood

Cloth, 188 pages, 6⅛ by 9⅛ in., illustrated. Published by Stanley Tools, Division of The Stanley Works, New Britain, Conn.

This useful little book for the home craftsman has passed through many printings. This revised edition will be hailed by many craftsmen as a handy instructor and a great help.

Senior Mathematics

By Harl R. Douglass and Lucien B. Kinney. Cloth, 437 pages, 5½ by 8 in. Price, $1.52. Henry Holt & Co., New York City.

A book on general mathematics especially helpful to those of less than average mathematical ability. The scope of the subject matter covered, however, is such that it will be quite useful to many who are preparing for vocational pursuits that do not require extended mathematical knowledge.

The College and Teacher Education

Prepared by W. Earl Armstrong, Ernest V. Hollis, and Helen E. Davis. Cloth, 311 pages. Price, $2.50. American Council on Education, Washington 6, D. C.

This book presents a comprehensive view of the task of teacher education. It places special emphasis on the interrelatedness of all aspects of the matter and on the importance of group methods. The data have been carefully selected for their value in pointing up and making vivid the discussion of those topics which the authors have judged to be of the widest interest. The accent is on the things that have and have not worked out in terms of specific conditions and actual situations. The last three chapters are given over to the joint efforts of school systems and colleges in the in-service education of teachers, to the subject of integration, and to the author's final reflections and conclusions.

It outlines the pre-employment courses, supplementary courses, and the supervisory training courses now offered in the state, and shows how schools can establish and maintain proper industrial relations with employers and employees. It also illustrates how the school can organize a good publicity program.

Metals and Alloys Dictionary

By M. Merlub-Sobel. Cloth, 238 pages, 5¾ by 8¾ in. Price, $4.50. Chemical Publishing Co., Brooklyn, N. Y.

A dictionary of over 10,000 metallurgical terms, which, besides giving definitions, states the composition, properties, physical constants, and peculiarities of metals and alloys.

Basic Electricity for Communications

By William H. Timbie. Cloth, 5¾ by 8⅝ in. Price, $3.50. Published by John Wiley and Sons, Inc., New York, N. Y.

An excellent text for students and workers in electronics. It contains many problems for the student to solve, and there are numerous examples to show how the solutions are to be obtained.

A number of useful tables are contained in the appendix.

Dictionary of Engineering and Machine Shop Terms

By A. H. Sandy. Cloth, 153 pages, 5¾ by 8¾ in. Price, $2.75. Chemical Publishing Co. Inc., Brooklyn, N. Y.

A book containing the definitions of words commonly used by engineers and those who are connected with the work done in machine shops and the metalwork trades.

How to Build Solid Scale Model Warplanes
The Whittler's and Woodcrafter's X-Acto Handbook
Twelve Technics for the Artist, Student, and Teacher
The Commercial Artists' X-Acto Handbook

Published by the X-Acto Crescent Products Co., 440 Fourth Ave., New York 16, N. Y. Booklets have from 16 to 32 pages. Price, 10 cents each.

These booklets, besides showing how the various types and sizes of X-Acto knives can be used, present many unique and helpful kinks which help the whittler and the artist to do his work more efficiently and with less trouble and exertion.

Plants We Eat and Wear

By H. E. Jacques. Cloth, 171 pages, 5⅛ by 8⅛ in., illustrated. Price, cloth, $2.50; paper, $1.50. Published by the author, Mt. Pleasant, Iowa.

A very interesting book containing information about 70 families of plants which we use as foods or raiment.

Each plant is described briefly and an illustration shows how it grows, and what kind of leaves, fruits, and seeds, it bears.

Plan to Give Your Students the New Three R's with Porto-Power!

BE ready to teach Repairing, Rebuilding, Reconditioning with Blackhawk Porto-Power. When students learn to handle jobs the exclusive Porto-Power Way, they'll be using the method and equipment most widely used throughout the automotive truck, bus and tractor industries.

Porto-Power does everything the hands can do, but with tons of hydraulic power under fingertip control. Handles toughest push, pull, bend, press, straighten and clamp jobs faster, easier and better.

Its powerful hydraulic ram and big assortment of special attachments do an amazing range of body, motor, frame, axle and spring work. Porto-Power banishes old-fashioned hand methods — a vital item in modern training. Be sure to include Porto-Power in your future plans.

Write for your complimentary copy of the 80-page illustrated Porto-Power Shop Manual and literature on other BLACKHAWK products. Address the

BLACKHAWK MFG. CO.
Dept. P3355 Milwaukee I, Wis.

OTHER BLACKHAWK EQUIPMENT for Faster, Better Automotive Service and Repair

By their outstanding performance through years of dependable service, Blackhawk Wrenches, Hydraulic Service Jacks, and Hydraulic Hand Jacks have *earned* nation-wide recognition, and have become standard equipment in every phase of automotive and industrial work. It is essential that your students be familiar with these widely-used products.

A NEARBY Blackhawk Distributor will be glad to help you plan your postwar requirements for Porto-Power and your present needs for other Blackhawk equipment.

ARMY E NAVY

BLACKHAWK

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WOODWORKING PROJECTS FOR INDUSTRIAL ARTS STUDENTS
Original projects—wide variety of subjects—adaptable designs—shop drawings for all. $1.40

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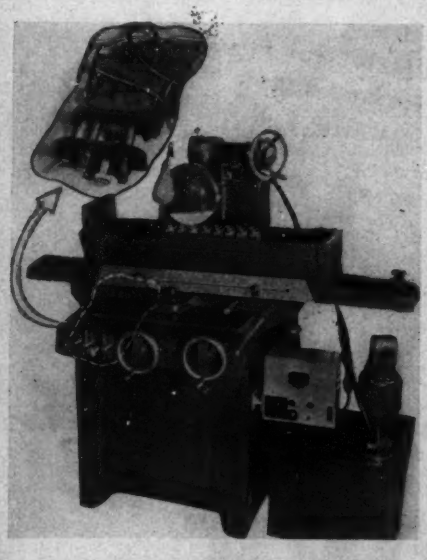
Shop Equipment News

New Products—Publications

NEW HYDRAULIC VALVE ON DOALL G-10 GRINDER

A new "five-in-one" hydraulic control valve has been incorporated in the DoAll G-10 Surface Grinder and provides increased speed, efficiency, simplicity of operation, and greater accuracies. This new machine tool will grind a surface with precision to 6 micro inches.



Five-in-one hydraulic valve

To obtain the required motions, three components are necessary:

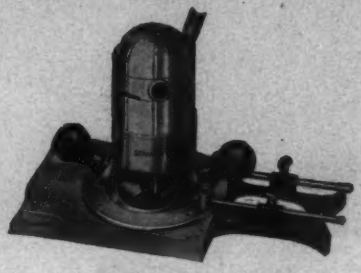
1. Selector valve. This valve has three positions: (A) Manual Crossfeed; (B) Automatic Crossfeed; and (C) Wheel dressing or rapid traverse. The operation of this valve is independent of the table action so that either the automatic crossfeed can be used for flat grinding or the manual crossfeed for form grinding.
2. Crossfeed control. This valve is used to control the mount of crossfeed or indexing at each table reversal when using the automatic crossfeed. It can be controlled to feed from .004 to .200.
3. Crossfeed directional valve. This valve is used to control the direction of the crossfeed in the automatic position and has a "neutral" position for stopping the carriage while in the automatic position for locating the work, etc.

For brief reference use IAVE—510.

STANLEY HAND ROUTER NO. 10A

Stanley Electric Tools announces an improved design in its No. 10A Hand Router. The No. 10A Router is used for routing, relief work, carving, inlays, and with attachments can be used for dovetails, beading and fluting, templet work, and for many shaping operations. It is powered with a universal, ⅜ h.p. motor, running at a speed of 18,000 r.p.m., producing a smooth finish on wood surfaces.

Features of the improved No. 10A hand router include a push button shaft lock for changing bits or cutters, or for removing or replacing chuck or shaper spindle. The heavy duty, double-pole switch is fully protected and is readily accessible for easy replacement. Switch lever is lodged in a recessed section of the housing so that it will not turn on accidentally. Brush caps are more fully protected from breaking, yet can be removed easily for check on carbon brushes.



10A hand router

For further information write to Stanley Electric Tools, New Britain, Conn.

For brief reference use IAVE—511.

NEW AIRCO HEATING TORCH WITH MULTI-FLAME TIPS

A new medium-weight heating torch has been announced by the Air Reduction Sales Co., 80 East 42nd St., New York 17, N. Y. This new torch (Style 9802) is especially designed for concentrated localized heating such as is required for bending, straightening and shrinking of steel plate as well as for silver-brazing of heavy copper plate in the manufacture of copper pipe. The torch is lighter in weight than heating torches that have been available in the past, yet it has equal gas capacity.

Five new multi-flame acetylene heating tips as well as two multi-flame propane heating tips, and three mixers, are available for the torch.

For brief reference use IAVE—512.

(Continued on page 43A)

EBERHARD FABER the makers of MICROTOMIC VAN DYKE Drawing Pencils

offers to all vocational and industrial art teachers this useful wall size chart (16½x27 inches) with 90 basic symbols shown for quick reference. It bears also a modest reminder of MICROTOMIC VAN DYKE Drawing Pencils. To encourage intelligent choice of proper sketching and tracing degrees is a sound part of your guidance. CLIP THE COUPON!

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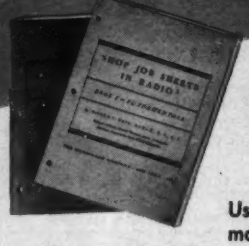
Lewis E. King's

Lathe Operations
Milling Machine Operations

Written by a man who is a master toolmaker and an experienced teacher, these two books give the student complete familiarity with the machines and their parts, all the essential technical data including the necessary math., and many useful "tricks of the trade." They are expertly planned for efficiency in teaching and insure maximum results from shop classes.

Each—fully illustrated with diagrams and photographs; $1.75

"The best of its type that has come to my attention."—F. X. Rettenmeyer, RCA-Victor Division, in INSTRUCTIONAL PROCEDURES



Robert N. Auble's

Shop Job Sheets in Radio

Book 1. Fundamentals
Book 2. Service Problems

Used in Signal Corps training, the material in these laboratory workbooks has been perfected for the most thorough and practical kind of training. They give complete, step-by-step exercises in the fundamentals of electricity, the use of the serviceman's tools, and the construction and operation of radio. "What-to-do" type of procedure is used throughout.

Large, clear illustrations, full references. Each $1.50

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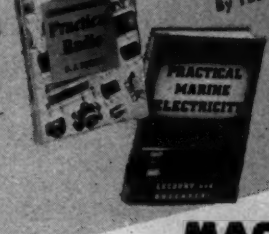
THE book for orientation courses in your rehabilitation program. 581 pp. $4.50



May and June

Introduction to Practical Radio
By Tucker. 332 pp. $3.00

Practical Marine Electricity
By Le Count & Dusenbery. 260 pp. $3.50

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Examination copies free to principals and supervisors

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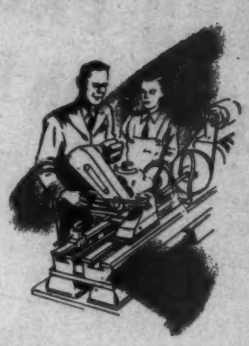

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DUMORE
PRECISION AND HAND GRINDERS

SOLD BY
AUTHORIZED INDUSTRIAL DISTRIBUTORS
IN ALL PRINCIPAL CITIES

(Continued from page 40A)

"HOW TO RUN A LATHE"

The South Bend Lathe Works has recently issued the forty-third edition of their popular book, "How to Run a Lathe." A number of changes in text material and illustrations have been made since the previous edition was printed in 1942.

This book contains the latest information on the operation and care of metalworking lathes. It covers such subjects as the operation of the lathe units, grinding cutter bits, making accurate measurements, plain turning, chuck work, taper turning, boring, drilling, reaming, tapping, cutting screw threads, reference tables, etc. Written clearly and concisely, it is widely used by machinists and as a shop text in schools and apprentice training courses. This edition contains 128, 5½ by 8-in. pages, and over 365 illustrations. Postpaid copies are available with paper covers for 25 cents or with leatherette covers for 75 cents in stamps. Write to South Bend Lathe Works, 178 E. Madison St., South Bend 22, Ind.

For brief reference use IAVE—513.

NEW DATA ON MAINTENANCE WELDING

A six-page folder on *Low Temperature* Welding rods, especially useful on maintenance jobs, has just been published by Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.

Although maintenance welding has been done in the past with every available welding process, Eutectic *low temperature* welding is well suited for solving many maintenance welding problems, because the low temperatures involve fewer risks. No new equipment is required for these new *low temperature* rods; all that is necessary are the new EutecRods which can be used with any oxyacetylene torch or arc equipment.

This new folder describes Eutectic's exclusive procedures fully, in which their rods, applied at low temperatures to cast iron, steel, aluminum, bronze, etc., produce clean, strong bonds which leave the welded part easily machinable. The strength of the machined part is unimpaired and the welding produces no distortion which is an important consideration in repair work.

The folder presents many suggestions for salvaging parts of many kinds.

For brief reference use IAVE—514.

BLACKHAWK CATALOGS

Catalog No. 243, published by the Blackhawk Mfg. Co., Milwaukee 1, Wis., describes the various types of open-end and box-type wrenches that are manufactured by this firm.

Among the special features embodied in these wrenches are the thumb-release lock-on which makes sockets, handles, and attachments act as a solid tool until pressure on the thumb-release permits them to separate.

Then there are the reversible mechanical and free-wheeling ratchets which are found so helpful in many jobs.

The torque indicators (Torkflash) with their flash signal to indicate when it is time to stop are also described, and their uses explained.

Blackhawk hydraulic equipment also is interestingly described and its many adaptations to numerous jobs shown.

The firm also publishes a service manual which is a real round the shop guide to those who do automobile body work, framework, general repairing, and tractor and farm implement repairing and reconditioning.

For brief reference use IAVE—515.

RADIO PARTS AND ELECTRONIC EQUIPMENT GUIDE BOOK

A comprehensive 68-page guide book for users of radio parts and electronic equipment has just been published by the Concord Radio Corporation, 901 W. Jackson Blvd., Chicago 7, Ill., or 265 Peachtree St., Atlanta 3, Ga. This book lists and offers standard lines of condensers, resistors, transformers, tools, testers, tubes, and other essential components and equipment. A special feature is the 16-page "Special Values" section.

A copy of this new guide book and revised listings may be obtained without cost by writing to either of the company's two addresses.

For brief reference use IAVE—516.

(Continued on next page)

A "MUST" IN EVERY ENGINE SERVICING COURSE

K&W Mechanical Method

OF RESTORING CRACKED ENGINE HEADS AND BLOCKS TO UNIMPAIRED SERVICE

TEACH THIS VITAL AND REMUNERATIVE ENGINE REPAIR METHOD

Repairing cracked or broken automotive and diesel engine blocks and heads by the K & W Mechanical Method is now standard practice with hundreds of fleet operators, engine builders and garages. It is used extensively by the Armed Forces and taught by ODT Training Schools. This method seals practically any heat, freeze or stress cracks in surprisingly fast time and the repair is guaranteed to last the life of the engine. No operation in servicing engines saves so much money in so little time.

NO ADDITIONAL SHOP EQUIPMENT NECESSARY

Tools required to make K&W Mechanical repairs are the type of portable power tools that are standard equipment in practically all school shops.

INFORMATION AND TRAINING

Complete information on the K & W Mechanical Method will be furnished you; or we will train your instructors without charge.

Learn more about the K & W Mechanical Method. Write.

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Silk Screen Process Printing, Wood Craft, Castings, Pottery, Wood Carving, Metalcraft and Jewelry, Airplane Model Building.

You'll probably want to emphasize Plastics and Metal as well as Leather. See the very complete sections on these crafts and Special Insert page on Aluminum.

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BOISE, IDAHO, The Book Shop, 319 N. 8th St.
BOSTON 16, MASS., Fellowcrafters, Inc., 130 Clarendon St.
CHICAGO 10, ILL., Chicago Craft Service, Craft House, 615 No. LaSalle St.
CINCINNATI 2, OHIO, A. E. Wilde Co., 136 W. 7th St.
CLEVELAND 13, OHIO, Cleveland Leather Co., 1817 W. 25th St.
DENVER 2, COLO., H. R. Meininger Co., 409 Sixteenth St.
DETROIT 26, MICH., Dearborn Leather Co., 834 Michigan Ave.
HONOLULU, HAWAII, T. H., N. K. Young Co., 7 No. Pauahi St. (P.O. Box 1556)
LOS ANGELES 55, CAL., Schwabacher-Frey Co., School Supply Division, 736-738 So. Broadway
LOUISVILLE 2, KY., Central School Supply Co., 311 W. Main St.
NASHVILLE 3, TENN., Nashville Products Co., 158 2nd Ave., N.
NEW YORK 7, N. Y., Warren Sales Co., Inc., 25 Park Pl.
PHILADELPHIA 6, PA., Garrett-Buchanan Co., School Supply Dept., 12-20 So. 6th St.
PORTLAND 4, ORE., J. K. Gill Co., 408 S. W. 5th Ave.
RICHMOND 9, VA., Flowers School Equipment Co., 327 W. Main St.
ST. PAUL 1, MINN., St. Paul Book & Stationery Co., 55-57-59 East Sixth St.
SYRACUSE 1, N. Y., Bardeen's, Inc., 543-45 E. Genessee St.
CANADA, TORONTO, Lewis Craft Supplies, Ltd., 8 Bathurst St.

Fellowcrafters INC. 130 CLARENDON ST. BOSTON 16, MASS.

(Continued from previous page)

DIFFICULT MILLING PROCESSES

Volume 1, No. 4 of *Report From Cincinnati Milling* (July-August, 1944, issue), published by The Cincinnati Milling Machine Co. and Cincinnati Grinders, Inc., Cincinnati, Ohio, presents a most excellent article on centerless grinding. It also describes circular milling, sharpening cutters for high speed carbide milling, and how to broach soft-metal parts.

For brief reference use IAVE—517.

EDUCATOR JOINS A.T.F.

Dr. E. Burnham Dunton, formerly of the Teachers College at New Britain, Conn., has joined the Department of Education of the American Type Founders Sales Corporation, 200 Elmora Ave., Elizabeth B, N. J., as assistant to John A. Backus, manager.

Dr. Dunton has had a broad experience in the field of printing education and the graphic arts, and his many friends will be glad to hear of his new connection.

NEW PRESIDENT OF THE COLUMBIAN VISE & MFG. CO.

At a recent board of directors meeting of The Columbian Vise & Manufacturing Co., Cleveland, Ohio, Dan C. Swander was made chairman of the board; Harold F. Seymour, president; Dan

H. F. Seymour
President, The Columbian Vise & Mfg. Co.

C. Swander, Jr., vice-president; and Albert F. Munhall, secretary-treasurer. The Columbian Vise & Manufacturing Company is the world's largest producers of vises. They manufacture machinists' vises, woodworkers' vises, pipe vises, blacksmiths' vises, and homeshop or utility vises.

The firm has been granted the Army-Navy "E" flag with three additional stars.

REAL RECOGNITION

A fourth star, in acknowledgment of high rate of production of military and naval goods, has been awarded the Delta Manufacturing Co., Milwaukee, Wis.

WAR PRODUCTION AWARD

The L. S. Starrett Co., Athol, Mass., makers of precision tools, indicator gauges, hacksaws, and steel tapes, has been authorized to add a third white star to its Army-Navy "E" pennant. This award is in recognition of the Starrett production record on tools and equipment essential to the war program.

THIRD STAR FOR ARMY-NAVY "E" PENNANT

The Armed Services has conferred upon the employees of the Black & Decker Mfg. Co., Towson, Md., the third renewal of the Army-Navy "E" Award for excellence in production.

This carries with it the right to add a third star to the Army-Navy "E" pennant which flies over the plant at Towson.

ARMY-NAVY E AWARD

The Army-Navy Production Award was conferred on the Algoma Plant, Algoma, Wis., and the New Rochelle Plant, New Rochelle, N Y., of the United States Plywood Corporation.

HANDEE
Tool of 1001 Uses

This basic tool should be in every school shop to teach students the quick, easy way to do precision work on metals, alloys, plastics, wood, horn, bone, glass, etc.

A WHOLE TOOLSHOP IN ONE HAND

The Handee uses 300 accessories to grind, drill, polish, rout, cut, carve, sand, saw, sharpen, engrave. Runs at a speed of 25,000 r.p.m. and fits any socket. Perfectly balanced. Weighs only 12 oz. Postpaid with 7 Accessories, $18.50.

COMPACT SCHOOL SET

A fine set to begin with, then add accessories as needed. Strong case contains a DeLuxe model Handee and 45 of the most popular and practical accessories. Postpaid, $25.00.

AVAILABLE TO ALL WHO HAVE PRIORITIES

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Brush Fibres, Tampico, Fibre Mixtures, Sterilised Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

E. B. & A. C. WHITING CO.
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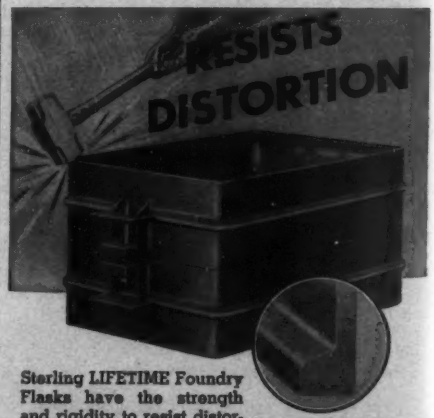

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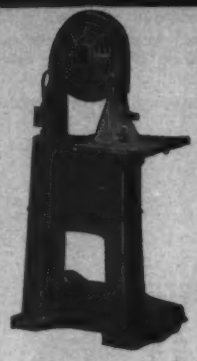
STERLING WHEELBARROW COMPANY · MILWAUKEE, WIS. U.S.A.

WALLACE

"MACHINE-OF-THE-MONTH"



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16" diameter wheels. 8" capacity under guide. Standard wheel speed, 1100 r.p.m. Blade speed, 4600 feet per minute. Geared motors, direct-connected ½, 1 and 2 h.p. Built-in light. Net weight, 335 lbs.

For fine cabinet and furniture work, the Wallace No. 16 Bandsaw has no equal.

Geared motors step up wheel speed, — permit faster, smoother and easier cutting. Dynamically balanced wheels make blade breakage miserly.

Swivelling table, exclusive Wallace feature, permits use of rip fence for accurate resawing.

Write today for bulletins, — we also manufacture quality-built universal saws, jointers, lathes, mortisers, shapers, glue pots, grinders, etc.

J. D. WALLACE & COMPANY

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For "on approval" copies, simply ring the numbers in the coupon below that correspond to the numbered titles you wish to examine.

1. WOODWORKING WORK BOOK—Nichols and Stiles. Acknowledged leader in its class—the most thoroughgoing, economical, fast-action workbook-textbook in the woodworking field. Information, tests, problems for beginners. Paper, 56c—**5 or more, only 42c ea.**

2. GENERAL SHOP HANDBOOK—Willoughby and Chamberlain. Another famous junior-high text. Takes up practical details of every common general shop subject. Illustrated tools, procedures. Paper, 92c—**5 or more, only 69c ea.**

3. ESSENTIALS OF WOODWORKING—Griffith and Cox. Without equal in simplicity, clearness, completeness of coverage for a standard course in hand woodworking. Prepared by one of the great teachers in school-shop history. Revised in the 1930's by George Cox of Oregon State. Cloth, $1.68—**5 or more, only $1.26 ea.**

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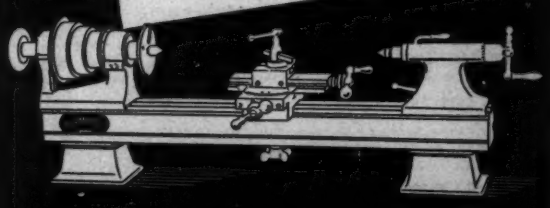

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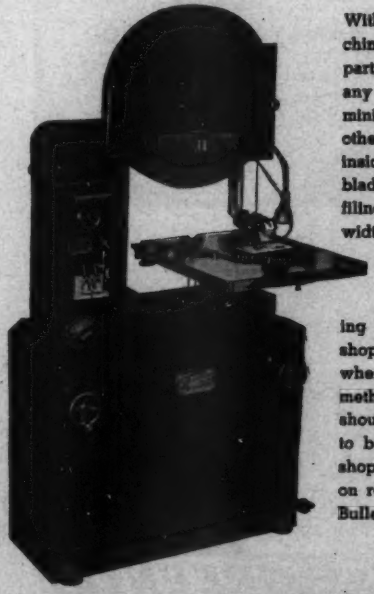

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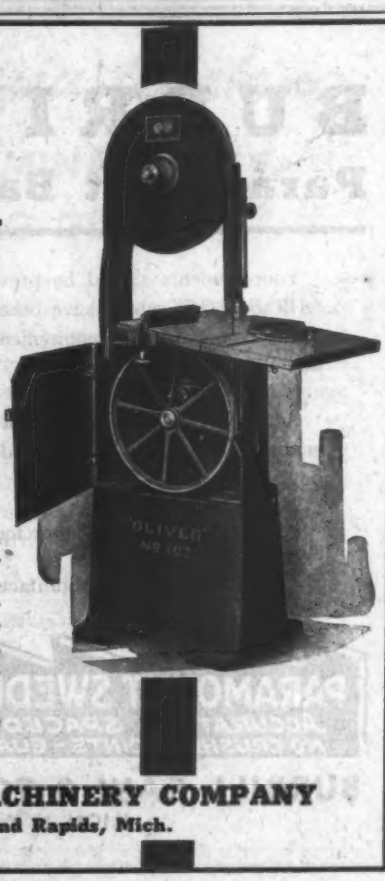

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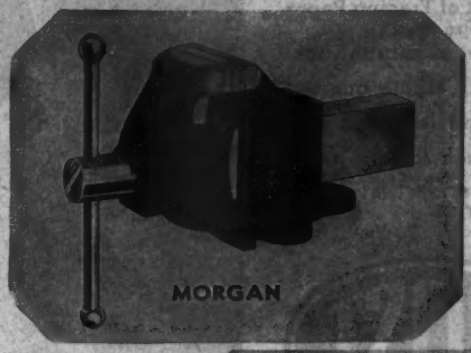

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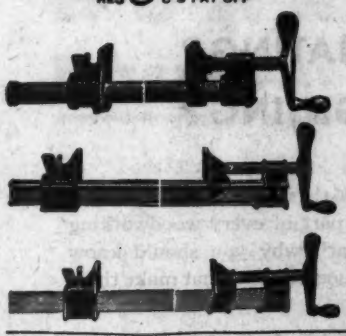

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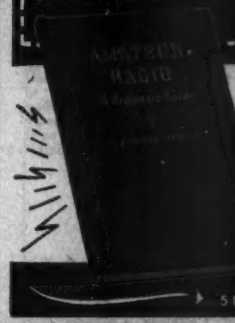

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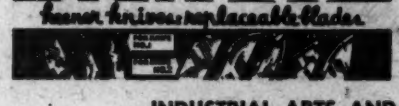

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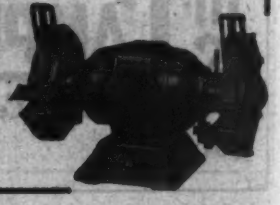

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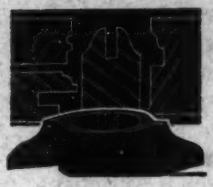

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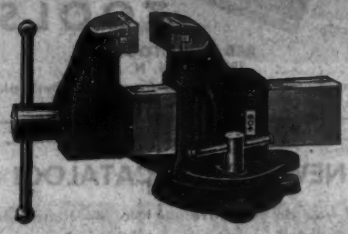

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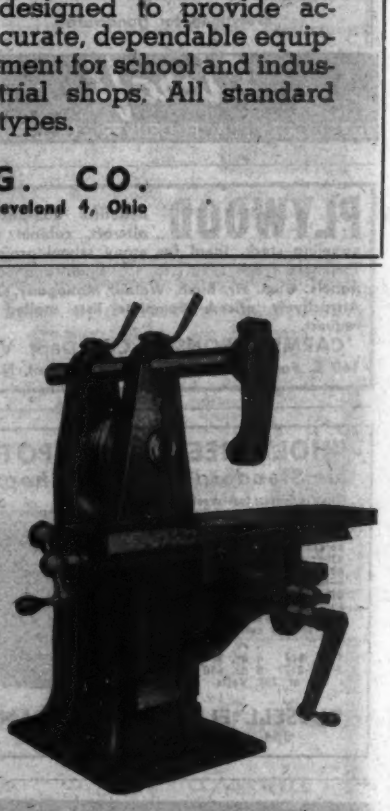

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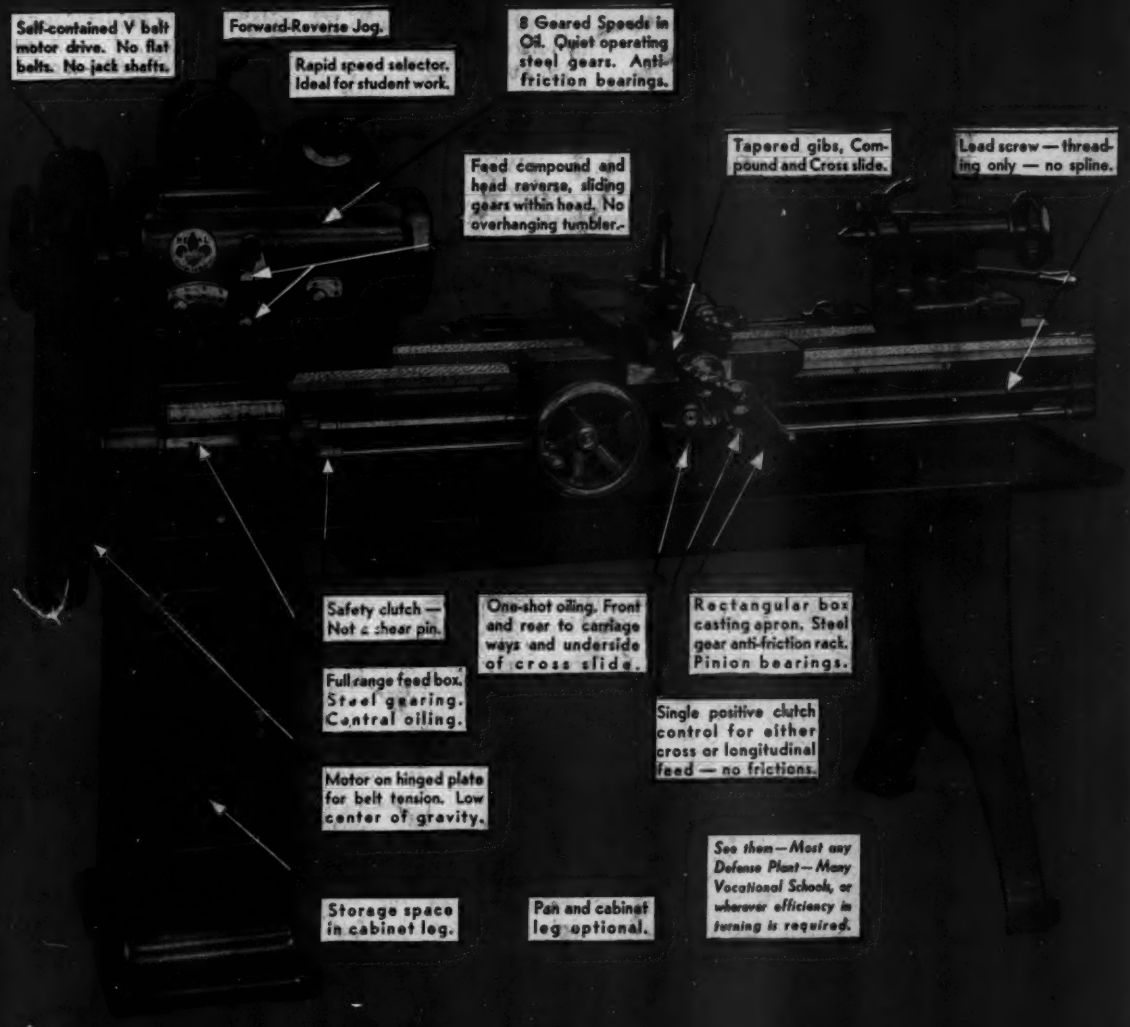
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